striata, albida; spira elongato-conica, apice acutiusculo, sutura anguste marginata; unfr. 8, convexiusculis, ultimo 1/2 longitudinis, antice ascendente, basi compresso, pone aperturam trisulcato; apertura subverticali, reniformi, ringente; columella profunde tridentata; perist. continuo, expanso, ad parietem appresso, lamina valida intrante juxta angulum parietis; margine columellari late, profunde et depresse sinuato; margine dextro superne sinuato, lamellis pluribus, guarum 4 longioribus, intrantibus munito.

Long. 14, diam. 6 mill.

Hab. Sierra Leone, West Africa (Coll. E. Higgins).

This species is somewhat near E. cyathostoma, Pfr., from Old Calabar, and is peculiar from the deep and depressed sinus in the left margin of the aperture.

DESCRIPTION OF PLATE XXVII.

Fig. 1, 1a. Apcrostoma bartletti, p. 375.

2, 2a. Cyane blandiana, p. 376.

3 Monocondylæa (Plagiodon) semisulcata, p. 376.

4, 4a. Helix (Plectotropis) christinæ, p. 377.

Hen (Picctotropis) mariella, p. 377.
 — (Picctotropis) mariella, p. 377.
 — (Acusta) brevispira, p. 377.
 — (Acusta) nora, p. 377.
 8, 8a. — (Camena) constantiæ, p. 378.
 — (Satsuma) albida, p. 378.

10. Clausilia (Phædusa) bensoni, p. 378.

11, 11a. Cyclotus taivanus, p. 378.
 12. Melaniella brevieula, p. 379.
 13. Drcissena swinhoei, p. 379.
 14, 14a. Helix (Corilla) damarensis, p. 379.

15. Ennca (Gonospira) ringens, p. 379.

June 9, 1870.

George Busk, Esq., F.R.S., V.P., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of May :---

The total number of registered additions to the Society's Menagerie during the month of May 1870 was 200, of which 45 were by birth, 54 by presentation, 83 by purchase, and 18 were animals received simply on deposit. The total number of departures during the same period, by death and removals, was 75, showing a net addition of 125 individuals to the collection during the month.

The most noticeable arrivals during the month were :-

1. A male Deer, received May 5th along with a collection of other animals transmitted to the Society from Singapore by H.R.H. the Duke of Edinburgh. This Deer, of which the exact locality has





1870.] THE SECRETARY ON ADDITIONS TO THE MENAGERIE. 381

not as yet been ascertained, is certainly different from any other Deer of which we have previously received living examples, nor am I able, after diligent search, to find any described species to which it can be referred. It is obviously most nearly allied to the *Cervus axis*, but is at once distinguishable by its smaller size, smaller ears, and general colour, which is of a dark chocolate. Under these circumstances I propose to confer upon it a temporary specific name, and to call it, after His Royal Highness the Prince who has sent it home,

CERVUS ALFREDI. (Plate XXVIII.)

General shape and appearance that of a small *Cervus axis*, but of a nearly uniform dark chocolate-brown colour, darker round the breast; whole sides of body ornamented with about six rows of not very distinctly marked pale yellowish spots; dorsal line and upper surface of tail not spotted; belly and under surface of limbs and throat pale yellowish brown, or fawn-colour. Head pale brown, darker between the horns; outer surface of ears black, sparingly covered with hair; inner surface of ears rather thickly covered with whitish hairs. Orbital sinus large and well developed, and surrounded with blackish hairs. Ears short and small. Muffle naked, wide, and very moist. Chin and upper part of throat pale yellowish white. Gland on metatarsus indicated by a small spot. Height 2 feet 6 inches; length of ear, from opening to tip, $3\frac{1}{4}$ inches; length of tail $3\frac{1}{2}$ inches.

Hab. Malayan peninsula, or adjoining islands (?). Viv. Soc. Zool. Londin.

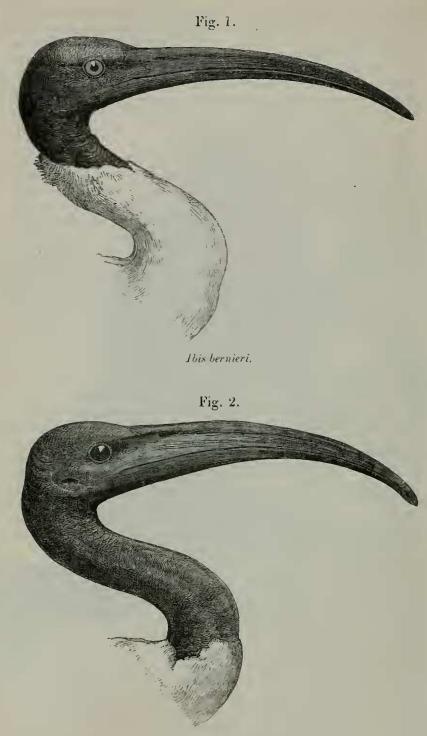
2. Three Bladder-nosed Seals (*Cystophora cristata*). On the 6th inst. we obtained by purchase, out of a whaling ship that had come into Dundee, two males and one female of the Bladder-nosed Seal (*Cystophora cristata*), of which I am not aware that living examples have previously been exhibited alive in this country. These animals are all quite young, but still show marked differences in colouring and in other particulars from the species of the genus *Phoca*. The curious inflation of the nose is at present but very slightly developed, but may nevertheless he observed occasionally when the head is protruded from the water.

3. Two Bernier's Ibises (*Ibis bernieri*) from Madagascar, obtained by purchase from the Société d'Acclimatation of Paris. The Sacred Ibis of Madagascar has been generally united to the *Ibis æthiopica* (s. religiosa) of the African continent*. Judging, however, by the present examples, there would appear to be ample grounds for specific distinction. The Madagascar bird, as will be apparent from the sketch now exhibited, and as any one who will take the trouble to examine the living birds will see more plainly, is at once distinguishable by the much less extent of the naked black skin upon the head (the white feathers ascending nearly to the top of the neck), by the longer and slenderer bill, and by the white iris. In the numerons specimens of *Ibis æthiopica* that have been in the Society's Gardens

* Cf. Finsch et Hartl, Vög. Ostafr. p. 733.

PROC. ZOOL. SOC.-1870, No. XXVI.

382 THE SECRETARY ON ADDITIONS TO THE MENAGERIE. [June 9,



This athiopica.

1870.] THE SECRETARY ON ADDITIONS TO THE MENAGERIE. 383

the iris has been invariably black. Under these circumstances 1 propose to adopt for the Madagascar bird the name Bonaparte has suggested for it (Consp. ii. p. 151). I may remark that M. Grandidier (Rev. et Mag. de Zool. 1868, p. 1) speaks of the Madagascar bird as a variety, and mentions its white iris and some other minor differences.

4. Two Guineafowls, received on the same day from the Société Zoologique d'Acclimatation, belonging to the section allied to Numida cristata, forming the genus Guttera of Wagler. These are the typical specimens on which Mr. Elliot (Ibis, 1870, p. 300) has established his Numida verreauxi, and will form the subjects of his figures of this species in his forthcoming work on the Phasianida. The locality from which these specimens were obtained is said to have been Natal.

5. A Black-headed Conure (*Conurus nandaya*), probably from Paraguay or the upper La Plata, being the first example of this scarce Parrot that I have ever seen alive.

6. A young male of the Black Wallaroo (*Osphranter robustus*, Gould, Mamm. of Austr. ii. pl. 11), being, as I believe, the first individual of this fine large Kangaroo that has reached the Society's Gardens alive. This animal was obtained by purchase from Mr. Hagenbeck, of Hamburg, on the 16th of May.

7. A male of the very singular Huia-Bird of New Zealand (*Hete-ralocha gouldi**), obtained by purchase on the 18th of May. Much interest attaches to this form on account of the extraordinary variation of the bill in the two sexes. We may hope that an anatomical examination of this bird, when it dies, may enable us to decide as to its place in the Natural System, which has hitherto been undetermined. Judging from external appearance, I should be inclined to place it either with the *Corvidæ* or with the *Meliphagidæ*.

The present specimen is said to have been obtained in the interior of the North Island, sixty miles north of Wellington.

8. A Tuatera Lizard (Sphenodon punctatum), purchased May 20th. A specimen of this extraordinary Lizard has been once before living in the Society's Gardens, having been deposited there by Dr. Günther in 1868⁺. The present specimen is said to have been obtained from one of the islands on the northern coast of the island, probably one of those mentioned in Dr. Bennett's note (P. Z. S. 1869, p. 227).

9. Three Buff Laughing Kingfishers (*Dacelo cervina*, Sharpe, Monogr. *Alced.* pt. 8), from North Australia, being the first examples of this species ever brought alive to Europe.

10. An example of a rare Macaque (*Macacus ocreatus*), purchased May 31st. This Monkey seems never yet to have been obtained by any collector; and its exact locality is unknown, though I suspect it to be from Celebes or from one of the Philippines. It is figured in these 'Proceedings' (1860, p. 420, pl. LXXII.), and in Wolf and Sclater's 'Zoological Sketches' (ii. pl. 1).

* Neomorpha gouldi, Gould, B. of Austr. iv. pl. xix.

† See P. Z. S. 1868, p. 530.

Prof. Newton, V.P., exhibited a series of large Falcons from Alaska, sent to him for determination by Prof. Baird, For. Memb., Assistant-Secretary of the Smithsonian Institution. Some uncertainty had hitherto prevailed as to the form of large Falcon which inhabited the north-west of America, or indeed any of the territory lying to the west of Hudson's Bay; but it would appear likely, from the statement of Richardson (Faun. Bor.-Am. ii. p. 28), that in some parts at least of that tract Falco candicans breeds. The birds from Alaska Prof. Newton referred without doubt to F. islandicus, though belonging to the darker phase of that form. He also adverted to the fact that in the lately published list of Alaskan birds by Messrs. Dall and Bannister* this large Falcon was included under the name of Falco sacer, Forst. (Phil. Trans. 1772, pp. 383, 423), remarking that, as had been previously shown (Ibis, 1862, p. 51, note), the species to which this name referred was certainly not a Falco at all as the genus is now restricted, and that, if Forster's diagnostic character, "iris yellow" (on which great stress was laid), could be trusted at all, the bird was most likely that which is generally known as Astur atricapillus.

Mr. Gould exhibited, and made remarks on, some specimens of Water-ouzels (*Cinclus*) killed in Norfolk, pointing out that these birds differed from the ordinary *Cinclus aquaticus* of Scotland, Wales, and Ireland, and agreed with the Scandinavian form called *Cinclus melanogaster*⁺.

Dr. J. Hawkes, F.Z.S., communicated a note on a case of hernia ventriculi in a common Canary-Finch (*Crithagra canariensis*).

The following papers were read :--

1. Contributions to the Ornithology of Madagascar.—Part I. By R. B. SHARPE, F.L.S., Libr. Z.S., &c.

(Plate XXIX.)

I have recently been favoured by Mr. Cutter, Natural-History Agent, of 35 Great Russell Street, Bloomsbury, with the inspection of a collection of birds formed by Mr. A. Crossley in the northern portion of Madagascar. Ornithologists are greatly indebted to Mr. C. Ward of Halifax, who, at his own expense, equipped Mr. Crossley for this expedition. As might be expected from the list of birds furnished by M. A. Grandidier (Rev. et Mag. de Zool. 1867, pp. 319, 353, 385, 417), the ornithology of this portion of Madagascar is of great interest; and I have therefore put together a few notes on the birds contained in the present consignment. Before I saw the collection, the British Museum had made their selection and had secured seve-

^{*} Transactions of the Chicago Academy of Sciences, i. p. 271 (1869).

[†] Cf. Stevenson's Birds of Norfolk, i. p. 69: and Salvin in Ibis, 1867, p. 115. -- En.



MYSTACORNIS CROSSLEYI.



.

.

1870.] MR. R. B. SHARPE ON BIRDS FROM MADAGASCAR.

ral unique specimens; but on my expressing a wish to be allowed to include in the present paper the names of the birds taken by the Museum, Mr. George Robert Gray not only very kindly showed me the whole of the skins obtained by him, but, on finding that I described two of them as new, he most handsomely withdrew the names he was himself intending to bestow on them in favour of mine. I have only to return him my best thanks for the assistance he has rendered to me in its preparation. To Professor Newton my thanks are due for lending me several rare specimens of Madagasear birds for eomparison.

Mr. Cutter informs me that Mr. Crossley first made a trip into the province of Vohima, in the northern corner of the island; but on this excursion he does not seem to have collected many birds. Afterwards returning to Tamatave, he proceeded inland to Antananarivo and thenee northwards to Nossi Vola, which, he informs me, is to the south-east of Lake Alout. Here, and at Saralalan, a place about seven or eight miles to the castward of Nossi Vola, most of the birds were collected.

I have referred to the following works and papers in the course of the present essay.

1. Dr. Hartlaub's Ornithologischer Beitrag zur Fanna Madagascar's, Svo. Bremen, 1861.

2. Notes on Birds observed in Madagasear. By S. Roch and E. Newton. (Part I., Ibis, 1862, p. 265; Part II., Ibis, 1863, p. 165.)

3. On the Mammals and Birds collected in Madagasear by Dr. Charles Meller. By P. L. Sclater, M.A. &c. (P. Z. S. 1863, p. 160)

4. Notes on a second visit to Madagascar. By Edward Newton, C.M.Z.S. (Ibis, 1863, pp. 333, 452.)

5. List of Animals collected at Mohambo, Madagascar, by Mr. W. T. Gerrard. By Alfred Newton, M.A. &c. (P. Z. S. 1865, p. 832.)

6. Notes sur les Mammifères et les Oiseaux observés à Madagascar, de 1865 à 1867, par Alfred Grandidier. (Rev. et Mag. de Zool. 1867, pp. 319, 353, 385, 417.)

7. Recherches sur la Faune de Madagascar et de ses dependances d'après les déconvertes de Fr. P. L. Pollen et D. C. van Dam. 2^{de} partie. Mammifères et Oiseaux, par H. Schlegel et Fr. P. L. Pollen, 4to. Leyde, 1868.

Fam. TURDID.E.

1. Hypsipetes ourovang.

Hypsipetes ourovang (Gm.); Hartl. Fann. Madag. p. 44 (1861); Roch and E. Newt. Ibis, 1862, p. 273; Sel. P. Z. S. 1863, p. 163; E. Newt. Ibis, 1863, p. 347; A. Newt. P. Z. S. 1865, p. 835; Grand. Rev. et Mag. de Zool. 1867, p. 359.

Hypsipetes urovang, Schl. & Poll. Faun. Madag. Ois. p. 296 (1868).

2. Tylas eduardi.

Tylas eduardi, Hartl. P. Z. S. 1862, p. 152, pl. xviii.

Tylas eduardsi (err.), Grand. Rev. et Mag. de Zool. 1867, p. 359.

Turdus goudoti, Verr. Nouv. Arch. i. p. 77, pl. v. fig. 2 (1866).

"Nossi Vola. Native name Kankimare."

"Female. Saralalan, Nov. 19th, 1869. Local."

M. Grandidier (l. c.) states that the original specimen of this species was not adult, and that the birds obtained by him in Madagascar differed materially from the description given by Dr. Hartlaub. The specimens procured by Mr. Crossley seem to be intermediate in plumage between the type specimen and the bird figured (l. c.) as *Turdus goudoti*, but do not have the white collar so distinct. If, as M. Grandidier asserts, the original *Tylas eduardi* is a young bird, we may conclude that the white collar is characteristic of the old bird.

I would remark upon what appears to be a curious case of mimicry in regard to this species, as compared with Vanga polleni, Schl. (Faun. de Madag. Ois. p. 174: 1868). The specimen before me agrees very well with the description given by the learned Professor; and I really supposed I had a specimen of Vanga polleni before me, till Professor Newton identified the bird as Tylas eduardi. All I can say is that, if Tylas eduardi, Hartl., and Vanga polleni are two distinct species, we have a case of mimicry which is almost unrivalled for interest; for it is evident that the Shrike assumed the plumage of the more peaceful Thrush because it doubtless served him well in pursuit of his prey.

Fam. TIMALIIDÆ.

OXYLABES, gen. nov.

- Rostrum elongatum, apicem versus compressum; maxilla mandibulum paullo superante : dertro recto, apice decurvato : gonyde ascendente setis brevibus ad basin mandibulæ : naribus ovalibus supra parvo membrano obtectis.
- Alæ rotundatæ, remige primo brevi, secundo et tertio gradatim longioribus; quarto, quinto, sexto et septimo æqualibus et longissimis.
- Cauda longa, rectricibus duodecim, externa brevissima, duabus proximis gradatim longioribus, sex mediis longissimis et subæqualibus.
- Pedes robustissimi, unguibus validis; tarso scutellato, digito exteriore quam interior paullo longiore, halluce ambos superante.

The subjoined woodcut illustrates the characters of this new genus. The type is

3. OXYLABES MADAGASCARIENSIS.

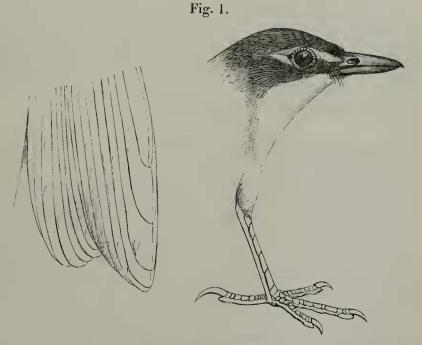
Ellisia? madagascariensis (Briss.); Hartl. Faun. Madag. p. 37 (1861).

"Nossi Vola. Native name Cerun-cerun. Eye brown. Contents of stomach insects."

This bird appears to me to be without doubt the *Rossignol de* Madagascar of Brisson; and Professor Newton, who compared the

1870.] MR. R. B. SHARPE ON BIRDS FROM MADAGASCAR.

birds along with me with Brisson's description, agrees that we must have here the species described by him. The only point in which it does not absolutely agree is in the white spot behind the eye, which Brisson describes as fuscous; and he takes no notice of the white lores. This, however, will not warrant us in supposing that the present bird is not identical with the species described by Brisson, as will be seen from the following facts. I have now two specimens before me which differ from each other in some respects. In one the rufous on the head and breast is very distinct and pure, the lores and the spot behind the eye very pure white, as also the throat. This I take to be the adult male. The other bird is altogether duller in plumage, the spot behind the eye very small and dirty white in colour, while the lores are of such a dull white as hardly to be distinguished from the sides of the head, and I do not think could possibly be so, if the skin were not very carefully prepared. This specimen, which I take to be the female bird, agrees admirably with the descriptions of Brisson and Hartlaub.



Oxylubes madagascariensis.

I subjoin the descriptions of two birds now before me.

Male (?). Head rich sienna, obscurely fringed with brown on the forchead; lores and a spot behind the eye pure white; ear-coverts duller sienna; upper surface of the body olive-green, inclining to rufous on the sides of the neck; quills pale greyish brown, margined exteriorly with olive-green, especially the secondaries, the innermost of which are entirely of a dull olive-green colour; tail dull

olive-green, rather lighter on the under surface; throat pure white; upper part of the breast and centre of the abdomen pale rufous, becoming lighter on the latter; flanks olive-green; bill dark hornbrown, nearly black on the upper mandible and on the basal half of the lower mandible; the tip of the latter and edge of the former pale yellowish white; legs dark horn-brown, claws light brown. Total length 6.3 inches; of bill from front 0.6, from gape 0.88; wing 2.7; tail 2.5; tarsus 0.9.

Female (?). Generally similar to the last, but somewhat duller and more greenish on the upper surface; the head obscurely marked with dark brown, and the sienna of the head not well defined; the lores and the spot behind the eye dirty white and indistinct; throat white tinged with yellow; the rufous of the breast paler, less extended, and the middle of the abdomen yellowish olive. Total length 6.2 inches; of bill from front 0.6; wing 2.5; tail 2.45.

Fam. NECTARINIID.E.

4. Nectarinia souimanga.

Nectarinia souimanga (Gm.); Hartl. Faun. Madag. p. 52 (1861); Roch and E. Newt. Ibis, 1862, p. 272; Scl. P. Z. S. 1863, p. 162; E. Newt. Ibis, 1863, p. 342; A. Newt. P. Z. S. 1865, p. 834; Grand. Rev. et Mag. de Zool. 1867, p. 355; Schl. & Poll. Faune Madag. p. 70 (1868).

Several specimens of this Sun-bird were in the collection.

Fam. HIRUNDINID.E.

5. Phedina madagascariensis.

Phedina madagascariensis, Hartl. Faun. Madag. p. 27 (1861). Hirundo borbonica, Schl. & Poll. Faun. Madag. Ois. p. 68 (1868).

"Nossi Vola, Oct. 19th and 28th, 1869. Native name Chiden Chiden. Eyes brown. Three eggs. Local."

Dr. Hartlaub (l. c.) separates the Madagascar *Phedina* from the true *Ph. borbonica*, on account of its being somewhat lightercoloured, having a longer wing and tarsus, and also on account of its almost uniform white under tail-coverts. Professor Schlegel (l. c.) indorses Dr. Hartlaub's opinions to some extent, but observes that the difference of size mentioned by the worthy doctor was only accidental, but that the coloration of the Madagascar birds was somewhat lighter, and especially with regard to the whiter under tail-coverts.

Mr. Crossley brought two specimens, both differing in extent of colour from a Mauritius specimen given me by Professor Newton. The Madagascar birds are certainly lighter in colour; but, as regards size, they are, if anything, smaller than the one from the Mauritius. I notice one difference, however, in the tail-coverts which seems to have escaped the attention of both Dr. Hartlaub and Professor Schlegel; this is that, in addition to the much whiter colour of the under tail-

1870.] MR. R. B. SHARPE ON BIRDS FROM MADAGASCAR.

coverts in the Madagascar bird, they seem to be a good deal longer than in the species from Mauritius. This may be accidental and exist in my specimens alone, but, if found to be constant, would add another link in the present very slight chain of evidence as to the specific distinctness of the two birds. A full description of my Madagascar specimens is given in my paper on the African Swallows (P. Z. S. 1870, p. 296).

Fam. MUSCICAPIDÆ.

6. TERPSIPHONE MUTATA.

Tchitrea holosericea (Temm.); Hartl. Faun. Madag. p. 45 (1861). Tchitrea mutata (Linn.); Hartl. Faun. Madag. p. 45 (1861); Sel. P. Z. S. 1863, p. 163; A. Newt. P. Z. S. 1865, p. 835; Grand. Rev. et Mag. de Zool. p. 385.

Muscipeta mutata, Schl. & Poll. Faun. Madag. Ois. p. 76 (1868). Tchitrea pretiosa, Less.; Hartl. Faun. Madag. p. 46 (1861); E. Newt. Ibis, 1863, p. 347.

"Nossi Vola, Oct. 22nd, 1869. Native name Skate. Eyes black or dark blue."

The changes which this species goes through are wonderful. Specimens in all stages of plumage are contained in the present collection, exhibiting all the differences portrayed by Professor Schlegel in his plates (*l. c.*).

Fam. LANIIDÆ.

7. CEBLEPYRIS MAJOR, Sp. n.

C. affinis C. canæ, sed conspicue major, coloribus saturatioribus, et rectricibus albo latiore marginatis.

The specimens sent by Mr. Crossley are very much larger than ordinary specimens of *Campephaga cana*; and both Mr. G. R. Gray and Professor Newton agree with me that the species is distinct from the bird collected by Messrs. Pollen and Van Dam in N.E. Madagascar, of which we have a considerable series in this country. In the last-mentioned birds the wing measures barely 4 inches in length, while in the specimens just received it reaches 4.4 inches, and, in addition to the longer wing, the whitish-grey tips to the tail-feathers are very much broader.

8. ARTAMIA VIRIDIS.

Leptopterus viridis (Gm.); Hartl. Orn. Madag. p. 48 (1861); Roch and E. Newt. Ibis, 1862, p. 273; E. Newt. Ibis, 1863, p. 348; A. Newt. P. Z. S. 1865, p. 835.

Artamia viridis, Grand. Rev. et Mag. de Zool. 1867, p. 386; Schl. & Poll. Fann. Madag. Ois. p. 84, pl. 27.

"Saralalan, Nov. 20th, 1869. Native name Vorun sasat."

I cannot perceive any characters whereby the present bird may be generically separated from *Artamia leucocephula*, the type of the genus *Artamia*.

9. CALICALICUS MADAGASCARIENSIS.

Calicalicus madagascariensis (Linn.); Hartl. Faun. Madag. p. 50 (1861); Grand. Rev. et Mag. de Zool. 1867, p. 386.

Lanius madagascariensis, Schl. & Poll. Faun. Madag. Ois. p. 99. Hylophorba ruticilla, Scl. P. Z. S. 1865, p. 326, pl. 12.

"Nossi Vola, Nov. 13th, 1869, and Saralalan, Nov. 18th, 1869. Native name *Tit k'rush*. Eyes dark blue."

Mr. Crossley has sent two males. This bird appears to be rare in collections, and was not obtained by Mr. Edward Newton or his companions. M. Grandidier states that it is only found in the woods, singly or in pairs.

10. DICRURUS FORFICATUS.

Dierurus forficatus (Linn.); Hartl. Faun. Madag. p. 49 (1861); Roch & E. Newt. Ibis, 1862, p. 274; E. Newt. Ibis, 1863, p. 348; Sel. P. Z. S. 1863, p. 163; A. Newt. P. Z. S. 1865, p. 834; Grand. Rev. et Mag. de Zool. 1867, p. 386; Schl. & Poll. Faun. Madag. Ois. p. 79.

"Nossi Vola. Eyes red. Native name Ry-luv."

Every one interested in the *Dicruridæ* should read the entertaining account of the habits of the present bird, as detailed by Messrs. S. Roch, E. Newton, Pollen, and Van Dam, the particulars adduced by the last-named authors being especially worthy of perusal. The habits, mode of breeding, and form of nest are thoroughly Shrikelike.

All the specimens sent by Mr. Crossley were in fine condition, the plumage being especially bright and glossy. I have also in my collection a specimen from Madagascar, purchased from the "Maison Verreaux;" but the exact part of the island in which it was collected is not specified. This bird is somewhat smaller, has a much slighter crest, and has the whole plumage less bright; indeed it would seem to constitute a small race of *Dicrurus forficatus*. This is worth noticing, though no one would wish, in the face of the difference of measurements brought forward by Professor Schlegel as occurring in specimens from the same locality, to separate the two birds as distinct species.

Fam. ZOSTEROPIDÆ.

11. ZOSTEROPS MADAGASCARIENSIS.

Zosterops madagascariensis (Linn.); Hartl. Faun. Madag. p. 40 (1861); Scl. P. Z. S. 1863, p. 163; E. Newt. Ibis, 1863, p. 346; A. Newt. P. Z. S. 1865, p. 834; Grand. Rev. et Mag. de Zool. 1867, p. 357; Schl. & Poll. Faun. Madag. p. 71, pl. 19 (1868).

"Tamatave."

Fam. Sylviad.E.

12. EROESSA TENELLA.

Eroessa tenella, Hartl. P. Z. S. 1866, p. 219; Grand. Rev. ct

1870.] MR. R. B. SHARPE ON BIRDS FROM MADAGASCAR. 391

Mag. de Zool. 1867, p. 357; Schl. & Poll. Faun. Madag. Ois. p. 92, pl. 18 (1868).

This bird is beautifully represented in Professor Schlegel's plate in the 'Faune de Madagascar;' and he states in this work that in the form of its beak it resembles Zosterops and the Phylloscopi in style of coloration, but that the wings present a very different conformation, approaching rather in this respect the genera Calicalicus and Newtonia. In my opinion, however, its nearest allics are the South-African genera Eremomela and Dryodromas, it being, indeed, very close indeed to the latter genus, as appears from a comparison of Eroessa tenella with Dryodromas flavidus. Both genera possess well-marked hairy tufts on the feathers of the nape, this peculiarity being very prominent in Eroessa, less developed in Dryodromas, and apparently altogether wanting in Eremomela. The tarsus, moreover, is long and the leg robust in Dryodromas, but is altogether different from that of Eroessa, where the foot is small and weak and the tarsus short.

13. CISTICOLA MADAGASCARIENSIS.

Drymæca madagascariensis, Hartl. Faun. Madag. p. 53 (1861, descr. orig.); Roch & E. Newt. Ibis, 1862, p. 272; E. Newt. Ibis, 1863, p. 343; Scl. P. Z. S. 1863, p. 162.

Cisticola madagascariensis, A. Newt. P. Z. S. 1865, p. 835; Grand. Rev. et Mag. de Zool. 1867, p. 357; Schl. & Poll. Faun. Madag. Ois. p. 91 (1868).

"Nossi Vola. Native name Chinsen."

14. Ellisia typica.

Ellisia typica, Hartl. Faun. Madag. p. 37 (1861); E. Newt. Ibis, 1863, p. 344; Scl. P. Z. S. 1863, p. 162; A. Newt. P. Z. S. 1865, p. 835; Grand. Rev. et Mag. de Zool. 1867, p. 358.

Drymæca ellisii, Schl. & Poll. Faun. Madag. Ois. p. 91, pl. 28. fig. 2 (1868).

"Nossi Vola. Nov. 10th, 1869. Eyes brown. Insects in the stomach."

I am not sure that a detailed English description of the present bird has ever been furnished; and as diagnoses in our own language are always useful as an auxiliary help to the determination of any species, I subjoin the description of a fine specimen sent by Mr. Crossley in the present collection.

Above olive-brown, inclining to green on the head and nape, but becoming decidedly brown on the rump and upper tail-coverts; quills brownish black, margined exteriorly with olive-brown, especially on the secondaries, which are almost entirely of this colour, but are very dark; tail dark brown, with cross bands which are only conspicuous in certain lights, the shafts of the feathers black above, whitish brown beneath; lores yellowish; cheeks and ear-coverts brown varied with yellowish; throat whitish, on the lower part a few longitudinal dull brown markings; rest of the un-

der surface of the body dusky olive-brown, yellowish down the centre; edge of the carpal joint yellowish white, bill horn-brown, the lower mandible yellow; feet horn-brown, claws pale yellowish brown. Total length 6.2 inches; of bill from front 0.5; wing 2.4; tail 2.9; tarsus 0.8.

The intensity of the yellow on the throat and olive-brown on the under parts varies in specimens. In the female bird mentioned by Mr. E. Newton (l. c.), and the specimen of which has been lent to me by Professor Newton, the throat is nearly white, the longitudinal marks on the upper part of the breast very distinct, and the abdomen pale yellowish olive, all the colours being clearer than in the specimens in my own collection.

1 would here remark that Drymaca morelii, Pollen (Gray's 'Hand-list,' no. 2748), is the present bird (l. c. no. 2845). This oversight, which was pointed out to me by Mr. Gray himself, is not due to any fault of his, as the following facts will show. In the course of last year Mr. Gray received from Mr. Pollen a specimen of *Ellisia typica*, labelled in Mr. Pollen's own handwriting Drymaca morelii; and being at work on his 'Hand-list' at the time, he placed the bird in the genus Drymaca, supposing that the description was . published in Holland and would in due time make its appearance in this country. No description, however, appeared, the bird being afterwards recognized to be *Ellisia typica** by Mr. Pollen; but the names had already been printed before the mistake could be rectified.

MYSTACORNIS (nov. gen. Sylviidarum).

- Rostrum gracile, elongatum, compressum, dertro recto, gonyde versus apicem paullo ascendente, setis rictalibus nullis; naribus oblongis linearibus.
- Alæ moderatæ, rotundatæ, remige primo brevi, secundo et tertio gradatim longioribus, quarto, quinto et sexto æqualibus et longissimis.
- Cauda fere quadrata, rectricibus 10, mediis puullulo longioribus. Pedes graciles, tarso longo, haud scutellato; digitis lateralibus subæqualibus, exteriore ad basin medio conjuncto; unguibus debilibus.

This genus comes very near to *Tatare* and *Macrosphenus*, but has the bill more compressed, and may at once be distinguished by the absence of all rictal bristles.

The name *Mystacornis* was suggested to me by Mr. G. R. Gray; and 1 have adopted it, as it well expresses the configuration of the head of the typical species.

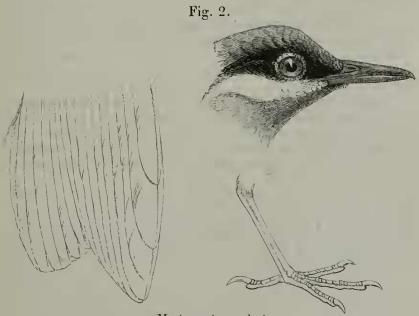
15. Mystacornis crossleyi. (Plate XXIX.)

Bernieria crossleyi, Grand. Rev. et Mag. de Zool. 1870, p. 50.

^{*} Exactly the same circumstances will account for *Saxicola arborca*, Pollen (Gray's 'Hand-list,' no. 3280), which is *Newtonia brunneicauda* (*l. c.* no. 4846), appearing in the 'Hand-list.'

1870. MR. R. B. SHARPE ON BIRDS FROM MADAGASCAR.

- 3 ad. M. supra olivacens, fronte et capitis lateribus ardesiacis : linea lata per oculum eunte nigra : macula parva supraoculari et linea a basi mandibulæ orta et ultra regionem paroticam producta pure albis : remigibus nigricanti-brunneis, extus brunnescenti-olivaceo lavatis : gula saturate nigricanti-ardesiaca : pectore pallide ardesiaco, abdomine versus albicante : abdomine imo pure albo : corporis lateribus olivaceis : rostro nigro : pedibus corneo-brunneis.
- ad. A mari diversa: supra omnino olivacea, capite summo concolori: capitis lateribus sordide ardesiacis: regione parotica nigricante: genis cum gutture toto et pectore medio albicantibus: cæterum fere ut in mari colorata.



Mystacornis crossleyi.

Adult male. Above olive-brown; forehead and sides of the head slaty-grey; feathers in front of the eye, encircling the latter and extending beyond the ear-coverts, deep black; a little line of feathers above and below the eye, as well as a line of feathers along the cheeks, white; quills blackish brown, margined exteriorly with olive-brown, especially the secondaries, which are almost entirely of the latter colour; tail olive-brown; entire throat dark slaty grey, almost black; breast paler grey, becoming whiter towards the lower parts; abdomen pure white; flanks and under wing-coverts olive-brown; nnder tail-coverts white; bill black; feet pale horny brown. Total length 6 inches; of bill from front 0.8, from gape 1; wing 2.7; tail 1.7; tarsus 0.9.

Adult female. Head and entire upper surface olive-brown, somewhat inclining to green; sides of the head commencing from the

base of the upper mandible pale grey; ear-coverts black; cheeks white; throat white, somewhat tinged with grey on the upper part of the breast; middle of the belly white; flanks olive-brown; under tail-coverts white, broadly edged with olive-brown. Total length 6 inches; of bill from front 0.8, from gape 1; wing 2.9; tail 2.7; tarsus 0.9.

"a, b. Male and female. Nossi Vola, Oct. 28th, and Nov. 12th, 1869. Native name Surat ulu. Eyes black.

"c. Saralalan, Nov. 16th, 1869."

16. PRATINCOLA SIBYLLA.

Pratincola sybilla (Linn.); Hartl. Faun. Madag. p. 38; Roch & E. Newt. Ibis, 1862, p. 272.

Pratincola sibylla, E. Newt. Ibis, 1863, p. 345; Scl. P. Z. S. 1863, p. 163; A. Newt. P. Z. S. 1865, p. 836.

Pratincola pastor, Grand. Rev. et Mag. de Zool. 1867, p. 359.

Saxicola torquata, Schl. & Poll. Faun. Madag. Ois. p. 93.

"Vodirat, 25 miles N.W. of the capital. Native name Fittat. Male and female."

I must confess that it is with some little surprise that I have found the Stonechat of Madagascar united without a question to the Stonechat of Europe, Asia, and Africa ; for Professor Schlegel unites under the heading of Saxicola torquata, the following birds, which most of us are accustomed to regard as distinct species :-- Pratincola rubicola (Linn.), P. sibylla (Linn.), P. indica, Blyth, P. hemprichi (K. & B.), P. pastor (Voigt), P. albofasciata (Riipp.), P. borbonica (Bory). It seems to me that, of these, there can be little question that P. hemprichi, of which I have seen several specimens, P. albofasciata, and P. borbonica are all certainly distinct: and I do not wish to go into the question in the present inquiry; but having a goodly series of all the others, I think that a few remarks on them may be of some service to ornithologists. Now, as regards the distinctness of P. indica from our P. rubicola, I would state that I do not wish to separate these two species, although in the breeding males of the latter the red of the breast is more deep and extends further on to the abdomen than in Indian birds. For the absolute settlement of this question it will be necessary to compare a series of males and females shot in Europe and in India at precisely the same period of the year; and especial attention would have to be directed to the birds shot in the Punjab and North-western Provinces, where the Desert Region, which carries with it so many of our European forms to be included in the "Birds of India," ends, and the true Indian fauna commences. I would call the attention of Mr. Hume and the various other ornithologists who are now doing good work in that country to the probable existence of a small race of Pratincola indica inhabiting the hills near Simla. A pair in my collection from that locality are decidedly smaller than ordinary P. indicu.

Next, as regards *Pratincola torquata* (*Pr. pastor*, auet.), Professor Schlegel states that specimens from the Cape, Sonthern Siberia,

1870.] MR. R. B. SHARPE ON BIRDS FROM MADAGASCAR.

China, and Japan do not present the least differences. I regret that I cannot agree with him as to the identity of the South-African birds, which appear to contain constant characters whereby they may be at once distinguished. The male always has a conspicuous white rump, far more so than in P. rubicola; and this white rump is exhibited in the *female* of P. torquata, but is altogether wanting in the female of P. rubicola. I have a series of both species before me.

Lastly, as regards *P. sibylla*, which I have always looked upon as one of the most distinct of all the true Stonechats. The nearest ally of the Madagascar bird is, as might be expected, *P. torquata*; but it may be distinguished by the pure white belly and under tail-coverts, and the more sharply defined lower margin of the rufous breast, which seems to form a band of red, whereas in *P. torquata* it gradually shades off into the buff of the abdomen. Comparing the females of the two species together, that of the Madagascar bird is altogether greyer in tint above, and not so strongly tinged with buff on the abdomen.

17. Copsychus pica.

Copsychus pica, v. Pelz.; Hartl. Faun. Madag. p. 38 (1861); Grand. Rev. et Mag. de Zool. 1867, p. 368; Schl. & Poll. Faun. Madag. p. 95 (1868).

"Nossi Vola, Nov. 10th, 1869. Native name Fittat ala."

"Vodirat, 25 miles N.W. of Antananarivo."

Fam. MOTACILLIDÆ.

18. MOTACILLA FLAVIVENTRIS.

Motacilla flaviventris, Verr.; Hartl. Faun. Madag. p. 39 (1861); Roch & E. Newt. Ibis, 1862, p. 273; Scl. P. Z. S. 1863, p. 163; E. Newt. Ibis, 1863, p. 346; Grand. Rev. et Mag. de Zool. 1867, p. 385.

In plumage this bird seems a connecting-link between the Pied Wagtails and our Grey Wagtail (*Motacilla sulphurea*), and possesses characters uniting the two sections of the genus *Motacilla*. In habits it appears strikingly similar to the last-named species.

Fam. PLOCEID.E.

19. PLOCEUS PENSILIS.

Nelicurvius pensilis (Gm.); Hartl. Faun. Madag. p. 54 (1861); E. Newt. Ibis, 1863, p. 349; Grand. Rev. et Mag. de Zool. 1867, p. 388.

Ploceus pensilis, Schl. & Poll. Faune Madag. Ois. p. 108 (1868).

"Nossi Vola, Nov. 11th, 1869. Native name Foode ala."

This Weaver-bird differs conspicuously in the sexes, the male having a beautiful black head, while the female has the head dusky olive, relieved by bright yellow cheeks, forehead, and eyebrow. I give a detailed description of the adult male and female, and also of a young male.

& ad. Head velvety black; nape rich orange; upper surface of the body olive-green, lighter on the rump and shading into brownish olive on the upper tail-coverts; quills brownish black, the inner web grey at the base, the outer web of the primaries narrowly edged with bright olive-green; the secondaries more broadly, the innermost ones being almost entirely olive-green; tail brownish black, each feather marked exteriorly with brownish olive; chin black; entire throat and sides of the neck rich golden yellow, becoming deeper on the lower part of the throat; below the throat a narrow band of feathers olivegreen like the back; rest of the under surface of the body dark slaty grey; vent and under tail-coverts chestnut; under wing-coverts light grey, marked with olive-green.

 \mathfrak{P} ad. Head olive-green, bright yellow on the forehead and over the eye; space between the bill and the eye and the ear-coverts deep brown, the latter distinctly washed anteriorly with golden yellow; throat and upper part of the breast, sides of the latter, extending backwards and forming a neutral collar, rich golden yellow; remainder of the plumage as in the male.

Juv. Head, nape, and entire upper surface olive-green; a line of feathers extending backwards from the bill over the cye bright golden yellow; space between the bill and the eve dull black; cheeks and ear-coverts pale yellow, strongly tinged with olive-green, throat and sides of the neck rich golden yellow, but no nuchal collar, a few yellow feathers appearing here and there indicating where the collar will ultimately come.

Fam. STURNIDÆ.

20. HARTLAUBIA MADAGASCARIENSIS.

Hartlaubia madagascariensis (Linn.); Hartl. Faun. Madag. p. 52 (1861); Roch & E. Newt. Ibis, 1862, p. 275; Scl. P. Z. S. 1863, p. 163; E. Newt. Ibis, 1863, p. 349; A. Newt. P. Z. S. 1865, p. 836; Schl. & Poll. Faun. Madag. Ois. p. 105 (1868).

Hartlauba madagascariensis, Grand. Rev. et Mag. de Zool. 1867, p. 357.

Several specimens.

Fam. PARADISHDÆ.

Subfam. PHILEPITTINÆ.

21. Philepitta castanea.

Philepitta sericea, Hartl. Faun. Madag. p. 42 (1861).

Philepitta geoffroyi, Hartl. Faun. Madag. p. 42 (1861).

Brissonia nigerrima, Hartl. Faun. Madag. p. 42 (1861).

Philepitta jala, Grand. Rev. et Mag. de Zool. 1867, p. 356; Schl. & Poll. Faun. Madag. Ois. p. 87 (1868).

Philepitta castanea (Müll.); Gray, Hand-1. of B. i. p. 297 (1869).

The genus *Philepitta* stands preeminently forward as one of those peculiar forms which Madagasear produces, and the affinities of which it is so very hard to determine; but its present position in the

ornithological system seems to me certainly open to question. Mr. George Robert Gray, in his recent 'Hand-list,' places it in the family *Pittidæ*; but with these birds it appears to me to have no direct affinity, as it wants the extraordinary development of foot so characteristic of these birds. Prince Bonaparte places it near the African genus *Dilophus* with apparently more discrimination; but in habits it essentially differs, for *Dilophus* is Starling-like in all its economy. I should prefer to keep *Philepitta* away from the *Turdidæ* altogether, and to class it near the Paradise-birds, of which family it may be considered an aberrant genus. Indeed it seems to form a separate subfamily, which may be called *Philepittinæ*.

If there is really no mistake in assigning Müller's name of *castanea* to the present bird, I can only give the learned Professor very little credit for discrimination—a point in which I feel sure that the most ardent admirer of the golden rule of priority, which so ruthlessly obliges us to allow the names of this "disturber" of ornithological nomenclature, would agree with me.

Four or five males of this beautiful bird were sent in the present collection, mostly in the fully black plumage figured by Professor Schlegel (l. c. fig. 1); one or two, however, had a few yellow edgings to the feathers, the last remains of the immature plumage. Judging from this fact, it would appear that the *Brissonia nigerrima* of Hartlaub, the original type of which is figured by Professor Schlegel (l. c. fig. 2), is the young male assuming the adult dress.

22. CAPRIMULGUS MADAGASCARIENSIS.

Caprimulgus madagascariensis, Sganz.; Hartl. Faun. Madag. p. 25 (1861); E. Newt. Ibis, 1863, p. 340; A. Newt. P. Z. S. 1865, p. 834; Grand. Rev. et Mag. de Zool. 1867, p. 353; Schl. et Poll. Faun. Madag. p. 64 (1868).

Fam. MEROPIDÆ.

23. MEROPS SUPERCILIOSUS.

Merops superciliosus, Linn.; Hartl. Faun. Madag. p. 31 (1861); E. Newt. Ibis, 1863, p. 340; A. Newt. P. Z. S. 1865, p. 834; Grand. Rev. et Mag. de Zool. 1867, p. 355; Schl. & Poll. Faun. Madag. Ois. p. 60.

Three specimens are in the present collection; and an examination of them entirely confirms the opinion expressed by Dr. Finsch (J. f. O. 1867, p. 237) and upheld by myself (P. Z. S. 1870, p. 145), that the Madagascar Bee-eater is identically the same as the continental species.

Fam. CORACIADÆ.

Subfam. CORACIANÆ.

24. Eurystomus glaucurus (Müller).

Eurystomus madagascariensis, Hartl. Faun. Madag. p. 27; Roch & E. Newton, Ibis, 1862, p. 270; E. Newt. Ibis, 1863, p. 341; PROC. ZOOL. SOC.—1870, No. XXVII.

Grand. Rev. et Mag. de Zool. 1867, p. 354; Schl. & Poll. Faun. Madag. Ois. p. 103 (1868).

Subfam. LEPTOSOMINÆ.

25. LEPTOSOMA DISCOLOR.

Leptosomus afer (Gm.); Hartl. Faun. Madag. p. 63 (1861); S. Roch & E. Newt. Ibis, 1863, pp. 166, 167; E. Newt. Ibis, 1863, p. 453; Schl. & Poll. Faun. Madag. Ois. p. 54 (1868).

Leptosoma discolor, Slater, P. Z. S. 1863, p. 628; A. Newt.

P. Z. S. 1865, p. 834; Grand. Rev. et Mag. de Zool. 1867, p. 354. A female specimen.

26. BRACHYPTERACIAS LEPTOSOMUS.

Brachypteracias leptosomus (Less.); Hartl. Faun. Madag. p. 28 (1861); E. Newt. Ibis, 1863, p. 341; Grand. Rev. et Mag. de Zool. 1867, p. 354.

One specimen, secured for the national collection.

27. Atelornis pittoides.

Atelornis pittoides (Lafr.); Hartl. Orn. Madag. p. 29 (1861); Roch & E. Newton, Ibis, 1862, p. 271; E. Newt. Ibis, 1863, p. 341.

Brachypteracias pittoides, Grand. Rev. et Mag. de Zool. 1867, p. 354.

"Nossi Vola and Saralalan. Native name Vorum Seak. Iris brown. Quite local."

Mr. Crossley has sent several specimens of this rare bird. I shall reserve my remarks on this species for a paper I am now preparing on the African *Coraciadæ*, which will very shortly be ready.

Fam. ALCEDINIDÆ.

28. CORYTHORNIS CRISTATA.

Corythornis cristata, Sharpe, P. Z. S. 1869, p. 568.

Corythornis vintsioides, Scl. P. Z. S. 1863, p. 162; Newton, P. Z. S. 1865, p. 834; Sharpe, Monogr. Alc. pt. 5 (1869).

Alcedo vintsioides, Grand. Rev. et Mag. de Zool. 1867, p. 354.

The full synonymy of this species is given in my 'Monograph;' but I have added one or two references which escaped my notice at the time.

29. ISPIDINA MADAGASCARIENSIS.

Ispidina madagascariensis (Linn.); Sharpe, Monogr. Alc. pt. 4 (1869).

Dacelo madagascariensis, Grand. Rev. et Mag. de Zool. 1867, p. 354.

"Nossi Vola, November 13th, 1869. Saralalan, November 19th, 1869. Native name *Birsi ala*. Eyes dark brown."

Fam. CUCULIDÆ.

30. COUA CRISTATA.

Coua cristata (Linn.); Hartl. Faun. Madag. p. 62 (1867); Roch & E. Newt. Ibis, 1863, p. 166; Grand. Rev. et Mag. de Zool. 1867, p. 392; Schl. & Poll. Faun. Madag. Ois. p. 57.

Serisomus cristatus, E. Newt. P. Z. S. 1865, p. 834.

One specimen.

31. CUCULUS ROCHII.

Cuculus canorus, Desjard. P. Z. S. 1832, p. 111.

Cuculus rochii, Hartl. P. Z. S. 1862, p. 224 (descr. orig.); Roch & Newt. Ibis, 1863, p. 166; E. Newt. Ibis, 1863, p. 453; Schl. & Poll. Faun. Madag. Ois. p. 53.

Cuculus himalayanus, Grand. Rev. et Mag. de Zool. 1867, p. 418. One specimen.

Fam. STRIGIDÆ.

32. Scops rutilus.

Scops rutilus, Pucher.; Hartl. Faun. Madag. p. 22 (1861). Scops menadensis, Grand. Rev. et Mag. de Zool. 1867, p. 320; Schl. & Poll. Faun. Madag. Ois. p. 49 (1868).

One specimen, secured by the British Museum.

Fam. COLUMBIDÆ.

33. FUNINGUS MADAGASCARIENSIS.

Funingus madagascariensis (Linn.); Hartl. Faun. Madag. p. 64 (1861); Scl. P. Z. S. 1863, p. 164; Roch & E. Newt. Ibis, 1863, p. 167; Grand. Rev. et Mag. de Zool. 1867, p. 418.

Ptilopus madagascariensis, Schl. & Poll. Faun. Madag. p. 113 (1868).

One specimen.

Fam. PHASIANIDÆ.

34. NUMIDA TIARATA.

Numida tiarata (Bp.); Hartl. Faun. Madag. p. 68 (1861); Roch. & E. Newt. Ibis, 1863, p. 168; E. Newt. Ibis, 1863, p. 454; A. Newt. P. Z. S. 1865, p. 836; Grand. Rev. et Mag. de Zool. 1867, p. 418; Sch. & Poll. Faun. Madag. Ois. p. 118 (1868).

One specimen, which has been secured by the British Museum.

Fam. SCOLOPACIDÆ.

35. GALLINAGO BERNIERI.

Gallinago bernieri, Pucher.; Hartl. Faun. Madag. p. 78 (1861); Roch & E. Newt. Ibis, 1863, p. 172; A. Newt. P. Z. S. 1865, p. 837; Grand. Rev. et Mag. de Zool. 1868, p. 4.

One specimen.

36. RHYNCHÆA CAPENSIS.

Rhynchæa capensis (Linn.); Hartl. Faun. Madag. p. 78 (1861);

Roch & E. Newt. Ibis, 1863, p. 172; E. Newt. Ibis, 1863, p. 457; Grand. Rev. et Mag. de Zool. 1868, p. 4.

Rhynchæa variegata, Schl. & Poll. Faun. Madag. Ois. p. 131 (1868).

One specimen.

37. CORETHRURA INSULARIS, sp. n.

Q. Supra nigra, pallide rufo striata: scapularibus, tectricibus alarum, dorso imo uropygioque rufo fasciolatis et irregulariter vermiculatis: remigibus saturate brunneis, secundariis rufo, sed primariis haud vermiculatis: cauda saturate castanea, nigro fasciata: loris pallide ochraceis: genis ochraceis, nigro maculatis: gutture toto pallide ochraceo, immaculato: pectore superiore rufescenti-ochraceo, nigro et (in pectore medio) albo variegato: corpore reliquo inferiore nigro, pallide ochraceo transfasciato. Long. tot. 6.5 poll., alæ 2.85, rostri a fronte 0.5.

"Nossi Vola. Eyes dark. Contents of stomach insects."

The present bird seems to be the female of an undescribed species of *Corethrura*; and it is very interesting to find a species of this truly African form in the island of Madagascar. Mr. G. R. Gray has drawn my attention to the fact that Messrs. Schlegel and Pollen have included *Crex jardinei* in their work (Faun. Madag. Ois. p. 161) as occurring in Madagascar; but I do not see on what authority. I do not for a moment believe the present bird will belong to any of the South-African species*.

Fam. RALLIDÆ.

38. BIENSIS MADAGASCARIENSIS.

Biensis madagascariensis (Verr.); Hartl. Faun. Madag. p. 79 (1861); S. Roch & E. Newt. Ibis, 1863, p. 173; A. Newt. P. Z. S. 1865, p. 837.

Rallus madagascariensis, Grand. Rev. et Mag. de Zool. 1868, p. 4. "Nossi Vola, October 19th, 1870."

39. RALLUS BERNIERI.

Rallus gularis, Cuv.; Schl. & Poll. Faun. Madag. Ois. p. 134 (1868).

Rougetius bernieri, Bp.; Hartl. Faun. Madag. p. 79 (1861); Scl. P. Z. S. 1863, p. 165; E. Newt. Ibis, 1863, p. 458; A. Newt. P. Z. S. 1865, p. 837.

Rallus bernieri, Grand. Rev. et Mag. de Zool. 1868, p. 4.

Three or four specimens were sent, in one of which the rufous of the neck is spreading over (or, perhaps, disappearing from) the white throat. This stage of plumage has not yet been accounted for.

* M. Jules Verreaux, who has seen the specimen since the description was written, believes that it is the *Corethrura cinnamomea* (Less.), from West Africa (Hartl. Orn. Westafr. p. 242); but, with all due deference to so good an authority, I still believe that the Madagascar bird will, on the comparison of specimens, prove distinct.



P. Z. S. 1870. PL. XXX

Young

Adult



NANNOPHRYNE VARIEGATA.



Fam. ANATIDÆ.

40. SARCIDIORNIS AFRICANA.

Sarkidiornis africana (Eyton); Hartl. Faun. Madag. p. 81 (1861); Grand. Rev. et Mag. de Zool. 1867, p. 5.

Anas melanotus, Schl. & Poll. Faun. Madag. Ois. p. 142 (1868). One fine male specimen.

2. Second account of Species of Tailless Batrachians added to the Collection of the British Museum. By Dr. A. GÜNTHER, F.R.S., F.Z.S.

(Plate XXX.)

In the 'Proceedings' of this Society, 1868, p. 478, I commenced to enumerate the species of Tailless Batrachians added to the collection of the British Museum since the publication of the 'Catalogue of Batrachia Salientia.' I am now able to add only six to the number then given. The total number of species amounts now to 319*, and that of typical specimens to 127.

The species added to the collection are the following :--

CLINOTARSUS ROBUSTUS (Mivart). ---? St. G. Mivart, Esq.

CERATOPHRYS MEGASTOMA (Spix)[†]. Surinam. Hr. Kappler.

CYSTIGNATHUS TÆNIATUS (Girard). Chiloë. Dr. Cunningham.

NANNOPHRYNE VARIEGATA (g. et sp. n.). Coasts of Magellan Straits. Dr. Cunningham.

BUFO HÆMATITICUS (Cope). Costa Rica. Mr. Higgins.

HYLA CORIACEA (Peters). Surinam. Hr. Kappler.

TOMOPTERNA NATALENSIS (Smith).

We have lately received this species from Madagascar. On comparing the example with Prof. Cope's description of T. labrosa (1868) from the same island; I am inclined to think that they are identical, or, in other words, that T. labrosa = T. natalensis.

NANNOPHRYNE (g. n. BRACHYCEPHALIN.).

In habit similar to a young Toad. Teeth none. Tongue elliptic, entire behind. No tympanum or cavum tympani. Apophysis of the sacral vertebra dilated. A pair of parotoids on each side, besides

* According to a statement of Prof. Peters (Monatsb. Ak. Wiss. Berlin, 1869, April), the Berlin Museum is richer than the British Museum with regard to the number of species, as it contained 325 species in the year 1869.

† This species has a slight transverse crest between the eyes.

other smaller similar glands scattered on the body and legs. Hind toes slightly webbed. A blunt tubercle at the base of the first toe.

NANNOPHRYNE VARIEGATA. (Plate XXX. figs. 1 & 2.)

Head of moderate width. Snout short, about as long as the diameter of the eye; no canthus rostralis, loreal region sloping. Choanæ very small. An ovate, well-defined parotoid gland behind the eye; another smaller at some distance behind it. There are other similar but very small glands on the crown of the head, on the sides of the neck, on the back, and one on the calf of the leg. In young examples all these glands are very indistinct. The length of the body equals the distance between the vent and the end of the first toc. Subarticular tubercles but slightly developed; metatarsus with two tubercles; no fold along the tarsus. Toes flattened, third and fifth equal in length; web very narrow.

The young is black, prettily ornamented with about five welldefined green, nearly white, bands, which run along the back, but are rather irregular on the head. Also the legs are black, with irregular green stripes and spots. Lower parts greenish, mottled with black, both colours being distributed in about equal proportions. In old examples the ornamental colours are indistinct; and they may be uniformly brown, with scarcely a trace of the pretty coloration of the younger state.

Specimens of this Frog were taken by Dr. Cunningham, the Naturalist of the Magellan Straits' Expedition at Puerto Bueno, Port Grappler, and in Eden Harbour. The largest is 35 millims. long, the hind limb being 47, and the fourth toe 13 millims. long.

LITORIA AUREA. (Plate XXX. fig. 3.)

Hyla aurea, auct.

A number of examples received from tropical parts of Australia, of the north as well as west, belong to a very marked variety of this widely distributed species. The bluish spots on the back are smaller and more numerous than in the type, and more distinctly marked, with a darker edge; and the lower sides are densely reticulated with black. Groin and inside of the thighs black, with white spots. The black reticulations are the more developed the larger the individual; and very young specimens have the lower parts white, entirely immaculate.

The figure represents an old example of this Frog.

3. Description of new Species of Pheasants from the Province of Yarkand, Eastern Turkestan, and from the Island of Formosa. By D. G. ELLIOT, F.L.S., F.Z.S., &c.

Through the kindness of Capt. C. H. T. Marshall, Bengal Staff Corps, I have been enabled to examine a small collection of mammals and birds, brought by Mr. Robert Shaw from the distant province of Yarkand, Eastern Turkestan. Mr. Shaw, although perhaps not the first European who has penetrated this country, is certainly, I believe, the only Englishman who has succeeded in getting away from it with his head on his shoulders. There were but few species brought by him : among the mammals there are some probably new to science; I hope to give a list of them shortly. Of birds there were only five specimens, four Pheasants and one *Tetraogallus himalayensis*. The Pheasants represent two new species, which I propose to call *P. shawii* and *P. insignis*. They belong to the true *Phasianus*, and may be described as follows.

PHASIANUS SHAWII, sp. nov.

Pileo summo nitide viridi ; collo postico et gutture toto, genis et colli lateribus purpurascente et viridi variantibus; dorso summo aureo-metallico, plumis macula apicali saturate indigotica notatis: dorso imo saturate castaneo, albo et nigro parum variegato et maculis paucis indigoticis notato, sub certa luce viridi nitente ; tectricibus supracaudalibus saturate castaneis unicoloribus, scapularibus aureo-castaneis, dorso proximis albo et nigro couspicue fasciatis : tectricibus alarum fere albis, majoribus late castaneo marginatis : remigibus pallide brunneis, secundariis albo marginatis; interioribus rufo marginatis, primariis intus albo fasciatis, extus albo lavatis et variegatis : cauda rufobrunnea irregulariter nigro fasciata, subtus albo et nigro variegata: pectore superiore metallice aureo-castaneo, plumis omnibus indigotica marginatis : pectore reliquo aureo-castaneo saturatiore ; hypochondriis aureis nitente purpureo terminatis : abdomine sordide brunneo, nigricante : rostro flavido.

Top of head and occiput brown, changeable to purple and green in different lights; rest of head, throat, and neck green, changing to blue and purple. No white ring round the neck. Feathers of upper part of back black at base running about two-thirds the length; shaft and adjacent part of middle of the feather white; between the black and the metallic golden brown edging is dull chestnut; each feather tipped with metallic blne. Scapulars, for the most part, chestnut, with small spots of metallic blue at the tip; bases of the feathers grey, shaft and centre white; between this white and the brown edging a bar of black. Shoulder white, a few feathers variegated with black, principally in the centre of the fea-Some of the greater coverts long and broadly margined with thers. chestnut. Secondaries pale brown, onter web slightly washed with rufons on the edge, mottled in the centre with fulvous and black. Rump chestnut-red, covered in some lights with greenish reflections; the ends of the feathers, which are very long, hiding the upper coverts, deep unchangeable red. Feathers of the upper part of the breast broad (with a rich blue spot in the centre at tip), deep rich chestnut, margined with brilliant blue. Feathers of lower part of the breast broader, and rather lighter in colour, bordered also with blue. Flanks golden brown, with a brilliant dark blue spot in the centre at

the tip. Abdomen brownish black. Under tail-coverts red. Central tail-feathers rufous brown, with short narrow black bars next the shaft, but not on the same line on both webs, and continued across the web by a bar of chestnut joining the black. Outer webs of lateral feathers similar; inner webs light brown, mottled with black, and barred at regular intervals with the same colour. Bill yellowish horn-

colour. Feet and tarsi greyish. Total length from base of bill to tail 16 inches; wiugs 9 inches; tail about 15 inches, bill, culmen $1\frac{1}{4}$ in., at gape $1\frac{1}{2}$ in.; tarsus $2\frac{1}{2}$ in.; middle toe 2 in.

Hab. Yarkand, Eastern Turkestan.

This interesting species appears to be very common in Yarkand, as Mr. Shaw states that he shot many of them, and, indeed, mistook it for the common Phasianus colchicus. To one who had not been accustomed to examine Pheasants at all critically this conclusion would be a very natural one, although the *P. shawii* differs in almost every respect from the better-known species. It is one of the most interesting discoveries yet made among the gallinaceous birds, affording links in the chain of descent, connecting the various species of true *Phasianus* together, which were heretofore entirely wanting. There is strong reason to believe that this new form of *P. shawii* is the original stock (looking at the subject in a Darwinian point of view) from which all the known species of Phasianus have sprung. By the newly discovered forms of *P. sladeni*, Andersson MS., from the province of Yun-nan, it would appear to exhibit the direction towards P. versicolor, and through Mr. Swinhoe's P. decollatus to the true P. torquatus, as known to ornithologists. On the other hand, by the next species, P. insignis, it bears off to P. mongolicus; and it would require only a few degrees of change for it to be merged in P. colchicus. Of course this is theoretical at present, as some necessary localities, from which we can naturally expect to receive other new forms supplying the remaining links still required are yet unexplored; but if we are to suppose that all true Pheasants have but one origin or source, all the information which has thus far been gathered upon the subject apparently leads us to the belief that the form now designated as P. shawii will have to be accepted as the one from which all the rest have sprung.

The species is a very handsome one, and peculiar from the almost uniform golden-yellow hue of the upper parts, and would be a most desirable acquisition, together with the other species already obtained, to parks and preserves.

Both the examples of this species, brought by Mr. Shaw, are males and precisely similar. The female is unknown.

PHASIANUS INSIGNIS, sp. nov.

Mas. Colli plumis ad basin nigris, parte mediana saturate castanea, apicibus latis nitenti-viridibus; dorso toto et scapularibus lætissime aureo-castaneis, fascia nigra una utrinque notatis, macula nitente viridi triangulari conspicue punctatis, rhachidibus albis: dorso imo uropygioque saturate castaneis: tectricibus alarum albis, intimis castaneo marginatis, exterioribus nigro et brunneo variegatis; remigibus pallide brunneis, fulvescenti-albo fusciatis: cauda rufo-brunnea nigro anguste et regulariter fasciata; rectricibus exterioribus, præcipue pogonio interno, nigro variegatis: pectore medio splendide aureo-castaneo, nitente viridi late terminatis: hypochondriis splendide aureis, apicibus conspicue nitenti-viridibus: abdomine imo tibiisque nigris: subcaudalibus castaneis paullo viridi nitentibus.

Fœm. Fulvo-brunnea, pallide rosaceo passim induta : dorsi plumis cinerascenti-brunneo marginatis, ante apicem fascia fulva, parte mediana rufo et nigro fasciata : remigibus pallide brunneis nigro transfasciatis : cauda rosaceo-brunnea, nigro transfasciata : subtus rosaceo-fulva; hypochondriis fasciis latis nigris conspicue notatis.

Male. Feathers of the neck black at base, deep chestnut in the centre, and broadly tipped with brilliant green : back and scapulars golden chestnut, with a triangular black bar starting from the shaft about a third of its length from the tip; shaft white; a triangular spot at the tip brilliant green; back and rump deep rich chestnutred; wing-coverts white, margined at the lower half with fulvous. Tail reddish brown, barred equally and at regular intervals with black for about half the width of the web, outer half barred with chestnut; lateral feathers reddish brown on the outer webs, grevish brown on the inner, barred regularly with black. Underside of tail-feathers chestnut, barred broadly and distinctly with black. Upper part of breast brilliant golden chestnut, broadly tipped with shining green; flanks bright golden, with the ends of the feathers covered with a large triangular spot of brilliant shining green; centre of abdomen and thighs black ; under tail-coverts chestnut, tips washed with shining green; feet and tarsus blackish brown.

Length from end of neck to rump 10 inches; wing 11 inches; tail 20 inches.

Female. General colour buff, tinged with a rosy hue; feathers of the back edged with ashy brown, before a band of yellowish, which is repeated two or three times, interrupting the black which runs along the shaft. Primaries pale brown barred with brownish black; tail rosy brown, barred irregularly with black; breast dark buff; flanks rosy buff, conspicuously spotted with black.

Hab. Yarkand.

This fine bird, which may be considered a second species of the group containing P. mongolicus, is even more brilliant in plumage than its ally, and will doubtless be considered hereafter the most beautiful of all the members of the restricted genus *Phasianus*. The feathers of the breast and flanks shine with the most brilliant metallic colours, and the living bird must be a splendid object. Unfortunately the two skins brought by Mr. Shaw are without the heads, and 1 am unable to give a description of that important part of the body; but as that portion varies but slightly in the true Pheasants, it would not be at all hazardous to suppose that the P.

insignis would resemble very closely in its head and neck the P. mongolicus, with the important exception that it will probably be without the white ring so conspicuous in its ally—as the feathers of the neck, which remain in the specimen in my possession show the commencement of the metallic blue and green hues so prevalent in the true Pheasants, but no indication whatever of any white. Although an ally of P. mongolicus, and equally large in size, it differs from that species in nearly every particular of markings and colour, being very much more brilliant in the hues of its plumage, and the metallic spots larger and more conspicuous. The under surface of the tail-feathers is very dark chestnut, and conspicuously barred with black, this part of its ally being rather faintly marked.

The female resembles the hen of *P. mongolicus* in its general appearance, but is readily distinguishable by a rosy hue, which is prevalent over the entire plumage.

This beautiful species was obtained by Mr. Shaw at Yarkand; but I am unable to state to what portion of the province it is restricted; for we cannot suppose it inhabits precisely the same locality as the previously described species.

PHASIANUS FORMOSANUS, Sp. nov.

Mas. Ph. pileo ochraceo-cinerascente viridi-nitente; fronte nigra; macula parva infraoculari et altera ad basin mandibulæ cum regione auriculari purpureo-nigris; facie nuda scarlatina; torque nuchali metallice viridi; striga superciliari et cinctu collari albis, hoc supra viridi terminato : dorso superiore læte stramineo, plumis omnibus macula triangulari nitenti-viridi notatis : scapularibus castancis, parte basali fusca nigro variegata, parte mediana alba nigro lineata: tectricibus alarum nulchre cincreis : remigibus brunneis, externe cinerascente lavatis et albo irregulariter notatis : secunduriis castaneo lavatis: dorso postico cinerco, nigro et ochraceo vermiculato; tectricibus supracaudalibus cinereis ochraceo tinctis: cauda parte mediana ochrascenti-cinerea, rufo externe marginata, late nigro supra partem cincream, rufo supra partem castancam fasciata : gutture toto et colli lateribus nigris viridi micantibus : pectore castaneo, lilacino nitente, plumis anguste indigotico marginatispectoris lateribus pallide stramineis saturate indigotico terminatis; pectore medio nigro, viridi nitente; abdomine nigro.

Fœm. Supra nigricans; collo postico castaneo, plumis albo et nigro versus apicem fasciatis; subtus fulvescens.

Male. Forehead dark green; stripe over each eye, commencing at the end of the green spot on the forehead and reaching to the occiput, white; top of head and nape light green; throat and neck metallic green, blue in some lights; a narrow white collar, interrupted in front, passing round lower part of the neck; upper part of back yellowish buff, basal half of the feathers black, except along the shaft, where it is buff, and the outer edges and a large triangular spot at the tip, brilliant green; scapulars broad, with their centres yellowish white, mottled with black at the basal end, but perfectly free from mottling 1870.]

elsewhere, this separated from the broad chestnut margin by a line of black; secondaries dark brown, mottled with buff and black, and very broadly margined with dark chestnut on the upper ones, the edges of rest yellowish brown; primaries dark brown, irregularly barred with yellowish white on both webs; back and rump light green mottled with buff and dark green. Upper part of breast deep rich red, purple in certain lights, margined with dark blue, and a triangular spot of the same in the centre at the tip; flanks white, the ends of the feathers dark metallic blue; abdomen dark green separated from the white of the flanks by a line of deep chestnut composed of the inner webs of the lowest flank-feathers. Thighs black ; under tail-coverts red. Central tail-feathers pale green in the centre, chestnut on the edges, the green barred with broad black bands elose together, these changing to chestnut on the edges; lateral feathers similar, but mottled with buff and black on the inner webs, and terminal portion of the outer web without bars; bill pale greenish yellow; tarsi and feet brownish; irides white.

Length 14 inches; wings $9\frac{1}{2}$ in.; tail $12\frac{1}{4}$ in.; tarsi $2\frac{1}{2}$ in.; middle toe $1\frac{3}{4}$ in.

Female. Head pale buff, much blotched with black on the crown, and rosy on the cheeks; npper part of back dark chestnut, with a terminal irregular bar of black and tipped with white; rest of upper parts black, the feathers margined with reddish buff, and the shafts buff; tail buff, closely barred with black, and mottled on the edges with the same; wings lighter than the back, the buff being more prominent, but similarly marked; primaries dark brown, and barred with yellowish buff as in the male; upper part of breast dark buff with a reddish tinge, some of the feathers with black longitudinal lines; rest of underparts dark buff faiutly mottled with brown.

Length 13 in.; wing 8 in.; tail 8 in.; tarsus 2 in.; bill $1\frac{1}{4}$ in.

This is the common Pheasant of the Island of Formosa, and, although resembling the well known P. torquatus of China, differs from it, in both the sexes, by many and striking characteristics. The male differs from that of *P. torquatus* by the narrow ring on the neck, the conspicuously broad white superciliary stripe, the lightcoloured mantle, the scapulars with their largely developed white centres free from mottling, the green rump (blue in its ally), the white flank-feathers, the broadly barred short tail, and by the white eye, which, as I am informed by Mr. Swinhoe, is a constant character. Some of the above-mentioned distinctions might be regarded by some as evidences of albinism; and if there were but a single specimen marked, the supposition might be an important one; but all those brought by Mr. Swinhoe agree together in their markings, and he tells me that all of this form upon the island also agree with these types. The female possesses equally peculiar markings to distinguish her from the hen of P. torquatus, being much darkerin fact, almost black upon the upper parts.

This species, although undoubtedly of the same origin as the *P*. torquatus, has, from the physical causes operating upon it peculiar to its island home, undergone in the course of time the changes which now present themselves to us, and which make it readily recognizable wherever seen. Although to some it may be decmed hardly entitled to a specific rank, yet it is certainly worthy of some appellation to enable it to be distinguished when mentioned; and as binominal names are the only ones admissible, it becomes necessary to give it specific rank, rather than to describe it as a variety. The true *torquatus* of China is not known in Formosa. In my Monograph of the Phasianidæ, now publishing, I shall give a Plate showing both sexes of this species, drawn by Mr. Wolf, which will exhibit its characteristics more clearly than my description has.

The discovery of these new species increases the number of truc Pheasants now known to ornithologists to nine, a list of which is here given.

1. PHASIANUS COLCHICUS.

Phasianus colchicus, Linn. et auct.

Hab. Mingrelia, the Ancient Colchis; River Ilia, Cancasus; Lake of Apollonia near Broussa, Albania; Gulf of Salonica, Ætolia.

2. Phasianus shawii.

Phasianus shawii, Elliot, P. Z. S. 1870. Hab. Province of Yarkand, Eastern Turkestan.

3. PHASIANUS INSIGNIS.

Phasianus insignis, Elliot, P. Z. S. 1870. Hab. Province of Yarkand, Eastern Turkestan.

4. PHASIANUS MONGOLICUS.

Phasianus mongolicus, Brandt, Bull. Acad. Scien. St. Pétersb. vol. iii. p. 54.

Hab. Altai and Tarbagatai Mountains; Gobi Desert, south of the Tangnu Mountains, Mongolia; Bonkhara.

5. PHASIANUS TORQUATUS.

Phasianus torquatus, Gmel. Syst. Nat. (1788), t. i. p. 742. Hab. Eastern China, from Transbaikalia, Amoorland, into Southern China; Provinces of Hankow, Tientsin, Foochow, and Pekin.

6. Phasianus formosanus.

Phasianus formosanus, Elliot, P. Z. S. 1870. Hab. Island of Formosa.

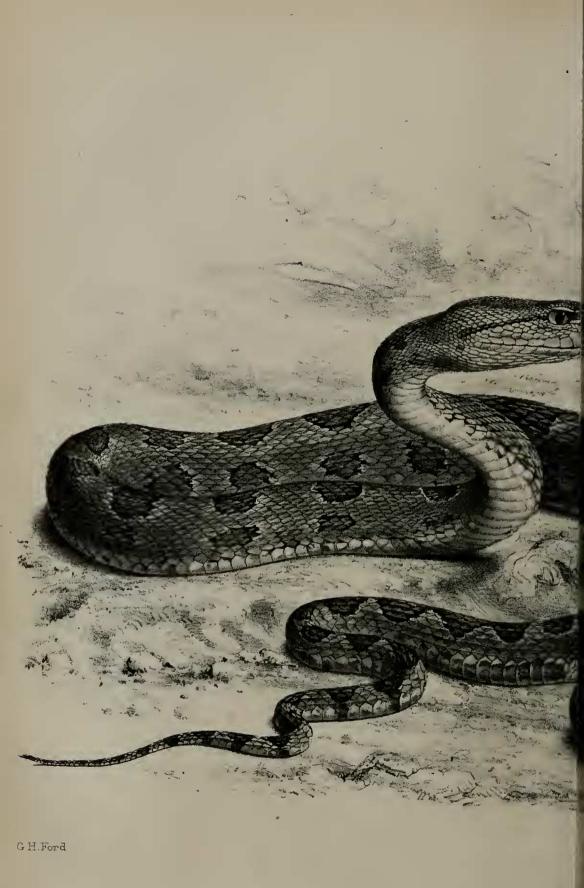
7. Phasianus decollatus.

Phasianus decollatus, Swinhoe, P. Z. S. 1870, p. 135. Hab. Eastern part of the province of Szechuen.

8. PHASIANUS SLADENI.

Phasianus sladeni, Anderss. MS. Hab. Western borders of the province of Yunan.





April 27



1870.] PROF. BARBOZA DU BOCAGE ON PELECANUS SHARPEL. 409

9. PHASIANUS VERSICOLOR.

Phasianus versicolor, Temm. Plan. Col. 486 & 493. IIab. Japan.

4. Note sur le jeune de l'année du *Pelecanus sharpei**. Par. J: V. BARBOZA DU BOCAGE, F.M.Z.S. &c.

Teinte générale d'un brun-roussâtre foncé ou couleur chocolat, noirâtre sur la tête, d'un ton plus clair (roussâtre) sur le bas du dos, le roupion, le bas-ventre et les couvertures supérieures et inférieures de la queue; couvertures supérieures et inférieures des ailes d'un brun-noirâtre avec une large bordure roussâtre; remiges primaires presque noires; remiges secondaires et tertiaires ainsi que les plumes de la queue, d'un brun clair au milien et d'un gris blanchâtre vers les bords; bec d'un jaune sale vers la base, d'un brun plus ou moins foncé dans le reste de son étendue; poche gutturale ainsi que les tarses d'un brun clair.

Dimensions. Longueur totale 1^m·46, aile 0·68, bec 0·35, tarse 0·145. Habitat. L'Afrique occidentale, Angola.

Obs. Degland décrit les jeunes de l'année du P. onocrotalus d'un cendre blanchâtre à la tete, au cou et en dessus du corps ; d'un cendré foncé au dos, aux scapulaires et aux couvertures alaires, avec les bordures d'une teinte plus claire; remiges noirâtres; bec et partie nue de la gorge et des joues livides; pied brun-cendré; iris brun.

Mr. Elliot (P. Z. S. 1869, p. 579) dit ce qui suit :--

"The young during the first year are uniform greyish brown, the lanceolate feathers of the breast being entirely wanting."

5. Note on Reptiles and Batrachians collected in various parts of China. By R. SWINHOE.

(Plate XXXI.)

1. PLATYSTERNUM MEGACEPHALUM, Gray; Günth. Reptiles of Brit. Ind. p. 43.

I procured a single specimen of this curious tortoise in a bird-shop at Canton. It is brought down the West River from the western parts of Kwangtung Province and from Kwangse. As recorded, the head, limbs, and tail are not capable of retraction within the shell; the tail is protected by curling under the right margin of the carapace. I kept my specimen alive through the winter without food.

2. DERMATOCHELYS CORIACEA (L.).

In the warm waters round Formosa the Green and the Tortoiseshell Turtles frequently occur; but these seldom show themselves in

* See the description of this species anteà, p. 173.

the colder seas of the China coast. During the years I spent at Amoy I never heard of a Turtle being captured but once; this was in October 1859. It was a large old specimen of this species, of a yellowish madder-colour. I wanted to buy it to preserve; but nothing would induce the fishermen to sell it for this purpose. They said a Turtle never appears on the China coast except when some great calamity is imminent, and to avert this good men must deliver it . from its captors and set it free. A Chinese firm in the town volunteered to do the good act. They purchased the Turtle, had Chinese characters cut on its back, signifying "set free for ever," which were filled in with vermilion, and, decking it with ribbons, took it in a boat in great state, with drums beating, to the outer limits of the harbour, where it was dropped into the sea. They said that if caught again the inscription on its back would protect it from meeting with further rough treatment.

The Turtle is with the Chinese an emblem of longevity.

3. CROCODILUS, sp.?

In February 1869 some Chinese were exhibiting in the native city of Shanghai what they called a Dragon, which they declared had been dug out of a hole in the province of Shense. It was a young Crocodile about 4 feet long, which they kept in tepid water. They made so much money by showing it that they refused to sell it. I cannot, of course, guess its species; but I nevertheless think the fact worth recording, as evidence that a species of this group does occur in China.

4. TACHYDROMUS SEPTENTRIONALIS, Günth. l. c. p. 70.

One specimen caught on the top of the city wall of Nanking. The Museum has specimens from Ningpo. It is a ground-Lizard, hiding under stones.

5. EREMIAS ARGUS (Peters).

Very common in the cultivated fields about Peking. The Musenm has specimens procured by me in 1860; but mention of these was omitted when the Society was made acquainted with the specimens collected by me during the North-China campaign (see P.Z.S. 1861, p. 391).

6. MABOUIA CHINENSIS (Gray), Günth. l. c. p. 83.

Specimens from the Pescadores. Very common about the milletfields of the largest Pescadore Island. A small race, and much spottedwith black.

7. EUMECES MODESTUS, Günth. l. c. p. 87.

Found on the rocky bank of the Yangtsze river in a gorge in eastern Szechuen, 1300 miles from the sea. Before known only from Ningpo.

1870.] MR. R. SWINHOE ON CHINESE REPTILES.

8. GECKO JAPONICUS (Dum. & Bibr.), Günth. l. c. p. 103.

From Chungkingfoo on the Yangtsze, in castern Szechuen, 1459 miles from the sea. Found inside houses in the city, clinging to the walls, also on the trees in gardens. Delights in uttering its "chuckchuck" note, especially in rainy weather. It is abundant in Taiwanfoo, Formosa.

9. IAPALURA SWINHOII, Günth. l. c. p. 133.

This comb-backed Tree-lizard was before only known from the woods of South Formosa. On my late expedition up the Yangtsze I found it on the rocks among woods near Chungkingfoo. It must therefore have a wide range across China.

10. ELAPHIS TÆNIURUS, Cope ; Günth. l. c. p. 242.

Captured at Shanghai. Has been procured before at Ningpo, in the Chikiang Province.

11. TROPIDONOTUS QUINCUNCIATUS, Russell; Günth. l. c. p. 260.

Dr. Günther says that this is the most widely distributed species of the Indian Water-snakes, extending from Mesopotamia to the south of China. My specimens are from Amoy.

12. TROPIDONOTUS STOLATUS (Linn.), Günth. l. c. p. 266.

From Amoy. This is by far the commonest Water-snake in Amoy and in Tamsuy (Formosa). In the latter place the country lads brought it to me by scores at a time.

13. HYPSIRHINA PLUMBEA (Boie), Günth. l. c. p. 280.

From Amoy, where it is by no means common.

14. HYPSIRHINA ENHYDRIS, Russell; Günth. l. c. p. 281. Also procured at Amoy.

15. HYPSIRHINA CHINENSIS, Gray; Günth. l. c. p. 283.

Captured at Ichang, 1111 miles up the Yangtsze river. The British Museum has specimens from China; but it is not known from what part of China.

16. HYDROPHIS CYANOCINCTA, Russell; Günth. l. c. p. 367.

This common Sea-snake is often floated into the small harbour of Takow, S.W. Formosa. My specimens are from there.

17. TRIMERESURUS MUCROSQUAMATUS (Cantor): Günth. l. c. p. 390. (Plate XXXI.)

From Formosa. Dr. Günther has made this out to be the species described by Cantor as *Trigonocephalus mucrosquamatus* (P. Z. S. 1839, p. 32), from Assam, from comparison of it with Cantor's drawing, the original specimen having been lost and no other since procured. Its occurrence in Formosa is somewhat singular. The two fine large specimens I have brought home were the only individuals I came across. One was brought to me from the interior; the other was captured at Takow, in the hall of a neighbouring Mandarin's office, having descended from the roof, in which it was lodged, by a rope on to a hanging lamp in pursuit of geckos (*Gecko japonicus*). It was tinted all over with blood-colour.

The specific characters of this snake, as kindly furnished to me by Dr. Günther, are :---

Scales in 25 rows, with a very strong keel to the tip, where it sometimes slightly projects. Ventral plates 217–220. Upperside of the head with very small granular scales; a series of larger ones along the canthus rostralis. Eleven upper labials, the second forming the anterior wall of the pit. Body brown, with a dorsal series of subrhombic, sometimes confluent spots; another series of similar more rounded spots along the lower part of the side. Each spot is of a dark brown colour, with a black margin, and generally a narrow white edge. Abdomen marked with brownish, each ventral shield having an ovate whitish spot on each side.

18. TRIMERESURUS ERYTHRURUS (Cantor), Günth. l. c. p. 386.

From Takow, Formosa. This is the first occurrence of this little green viper in Formosa. I have seen it frequently at Amoy; it is a bush-loving species, climbing to the top of plants, and coiling itself round the stems and leaves. Being of a fresh-green colour, it is not easy to detect; and while catching insects I have very narrowly escaped brushing my hand over the poisonous creature. The Chinese declare its bite to be fatal.

19. HALYS BLOMHOFFII (Boie), Günth. l. c. p. 393.

A specimen of this spotted brown Viper was brought on board the gunboat by some of the crew who had been on shore at Ichang, on the Yangtsze. It is known from Japan and Formosa; but this is the first instance of its occurrence in China proper.

20. RANA GRACILIS, Wiegm.; Günth. l. c. p. 409.

From Ichang. A common Frog in the rice-fields.

21. RANA SILVATICA, Leconte; Günth. l. c. p. 409.

From Ichang. Found in woods, among the dead leaves and decaying herbage.

22. DIPLOPELMA PULCHRUM (Hallon); Günth. l. c. p. 417.

From Ichang. I have met this wee Frog in various parts of China and Formosa. During the rains of spring and midsummer it occurs in thousands about grassy places. It does not resort much to wet rice-fields.

23. HYLORANA MACRODACTYLA, Günth. l. c. p. 424.

From Ichang. Does not climb trees, but keeps much to the damp ground about woods.

6. Notes on the Myology of *Platydactylus japonicus*. By Alfred Sanders, M.R.C.S., F.Z.S.

If one may judge from treatises on Comparative Anatomy recently published, the muscles of the Lacertilia do not appear to have received a great deal of attention. This consideration has emboldened me to lay the following notes on the myology of *Platydactylus japonicus* before the Zoological Society,—the more so as this species differs considerably in the arrangement of its muscular system from the *Iguana tuberculata*, the myology of which was described in a paper by Mr. St. George Mivart, published in the Society's Proceedings in 1867.

Hyo-mandibular.—On the ventral aspect of the throat are seen two superficial skin-muscles, the most anterior of which arises by means of a tendinous raphe covering the glosso-hyal, being thus united to its fellow of the opposite side; and passing directly outwards through the fibres of the mylo-hyoid, it is inserted into the supplementary or coronoid and opercular pieces of the mandible immediately beneath the posterior teeth.

The next muscle slightly overlaps the last anteriorly, and arises from the basihyal at the point where the anterior horns are given off, and from a thin aponeurosis over the hyomandibular, and also from one covering the trachea behind the same point. As far back as opposite the posterior end of the mandible it is divisible into three distinct portions; the posterior passes outwards and upwards, and spreads out into a thin layer, which is inserted into the superficial fascia at the back of the head, intimately connected with the trapezius. The anterior portion forms a thin layer, covering the external pterygoid, and is inserted into the supraangular piece of the mandible; its posterior fibres are collected into a thicker mass, which passes upwards and rather backwards behind the mandible, and is inserted into the aponeurosis of the side of the neck and the complexus. The middle portion passes upwards within the mandible, and is inserted into the extremity of the terminal segment of the anterior cornu (cerato-hyal) of the os hyoides, close to the attachment of the latter to the exoccipital. This latter part perhaps represents stylo-hyoid.

Mylo-hyoid arises from the body of os hyoides (basihyal) and from the posterior cornu (thyro-hyal) as far outwards as the external pterygoid, leaving a space through which that muscle passes. The fibres run forward, and are inserted into the whole length of the dentary piece of the mandible, with the exception of a small portion anteriorly close to the symphysis; it is also attached to the fascia covering the anterior point of the glosso-hyal; it is situated deeper than or above the preceding muscular layers.

Genio-hyo-glossus arises from the posterior cornu of the os hyoides just beyond its articulation with the basihyal; and passing forward, its superficial fibres are inserted into the symphysis of the mandible, while the deeper ones go to the side and back of the tongue; the

PROC. ZOOL. SOC.-1870, No. XXVIII.

superficial fibres also join those of the opposite side in a raphe covering the glosso-hyal.

Submentalis arises from the inferior surface of the dentary piece immediately outside and a short distance behind the symphysis, and is inserted into mucous membrane lining the floor of the anterior part of the mouth, and into the side of the tongue outside the genio-hyoglossus.

Thyro-hyoid arises from the basihyal, and is inserted into the outer circumference of the thyroid cartilage.

Cerato-hyoid arises from near the distal extremity of the thyro-hyal, and, passing downwards internal to the mandible, it is inserted into the segment of the cerato-hyal.

Omo-hyoid arises from the anterior border of the clavicle for about half its length, extending upwards to the claviculo-scapular articulation, and, passing forwards and downwards, it is inserted, broad and thin, into the posterior edge of the basihyal and thyrohyal.

Sterno-hyoid arises from the interclavicle thick and fleshy, and, passing forwards, spreads out into a thin plane of muscular fibres, which is inserted entirely into the thyro-hyal dorsad of the last.

Sterno-cleido-mastoid arises from the posterior edge of the transverse apophysis of the interclavicle, and is connected with the anterior edge of the sternum by means of a tough membrane; passing upwards and forwards across the clavicle, it receives a small muscular slip from that bone, and is inserted into the extremity of the exoccipital behind its articulation with the os quadratum.

Temporal is a very thick and powerful muscular mass, arising, behind, from the anterior surface of the os quadratum, above from the squamosal and parietal, and in front from the frontal; the anterior fibres run directly downwards, the posterior downwards and forwards; and all are inserted into the articular, supraangular, and coronoid pieces of the mandible.

Neuro-mandibular.—This muscle appears to correspond with one of that name in serpents. It arises broad from the aponeurosis of the back of the head and edge of the complexus, and is inserted narrow into the posterior extremity of the articular piece of the mandible.

External pterygoid arises fleshy from the lower surface of the posterior part of the pterygoid bone, and tendinous from the posterior border of the anterior part of the same bone; it forms a rounded muscular mass enclosing the posterior part of the mandible, and is inserted into the external surface of the supraangular, and npper surface of the posterior part of the articular piece; this last part also arises from the lower end of the posterior side of the os quadratum.

Internal pterygoid.—A triangular muscle with its apex directed upwards arises from the anterior point of the prootic, and from the columella, and is inserted into the inner border of the articular piece of the mandible behind the coronary process; this muscle has no connexion with the pterygoid bone. Within this are two remarkable muscles; the more external arises from a point at the lower surface of the parietal, just above the articulation of the prootic with the

columella, covered in by the membrane which connects the upper edge of that bone with the parietal, at the point of attachment of the membrane corresponding to the alisphenoid, and is inserted into the upper border of the pterygoid, behind the columella. The other muscle is internal, and arises from the membranous alisphenoid, beneath the last, in front of the exit of the third division of the fifth nerve, also from a membranous expansion attached to the external apophysis of the basisphenoid, and is inserted into the inner border of the pterygoid bone within and behind the last muscle, extending as far backwards as the inner border of the os quadratum; but it is not actually attached to this bone. Is it possible that these two muscles represent the tensor and laxator tympani? Their origins correspond to a certain extent; but the insertions are different. It is true that the latter approaches very closely to the os quadratum, which, although not the malleus, is next door to it. They seem to present as much correspondence as can be expected in a skull so widely different from that of mammals.

Digastric.—A thin muscle arising from the posterior front of the parietal and squamosal, immediately in front of the exoccipital; it passes downwards over the latter and behind the os quadratum, and developes a slender tendon, which is inserted into the extreme posterior point of the articular piece of the mandible. This appears to correspond to the posterior belly of the digastric.

Pectoralis major arises from the whole length of the middle line of the sternum, from about the centre of the interclavicle, as far as the end of the xiphisternum. The posterior fibres also arise from the rectus abdominis by means of a tendinous intersection; it is inserted into the summit of a hook-like process on the lower and outer surface of the humerus immediately beyond the humero-scapular articulation, which appears to correspond to the greater tuberosity, and into the surface of the bone beyond it.

Deltoid arises from the lower anterior and upper surfaces of the inner or lower extremity of the clavicle; it turns back between it and the coracoid, passing in front of the former, and covering the anterior part of the shoulder; it is inserted into the outside of the humerus, immediately beyond the head of the bone and in front of the outside head of the triceps.

Supraspinatus arises from the anterior half of the coracoid, and is inserted into the anterior point of the head of the humerus, in front of the insertion of the pectoralis major. This is called epicoracohumeral by Mr. Mivart; nevertheless I would venture to suggest that it corresponds to the supraspinatus, because it arises from the coracoid, and that process, attached as it is to the anterior part of the scapula, would point to the supraspinous fossa.

Teres minor arises from the anterior border of the scapula, at its junction with the coracoid, just dorsad of the coraco-scapular fenestra; it is attached to the capsule of the joint, and is inserted into the upperside of the head of the humerus, immediately beyond its articulation; it is bound down at its insertion by an aponeurosis attached to the long head of the triceps, and is covered over by the deltoid. Infraspinatus arises from the whole upper border of the scapula proper in a semicircular manner; a few of the anterior fibres arise from the internal surface of the bone; the fibres converge, and are inserted into the outside of the humerus beyond its head, dorsad of the insertion of deltoid, the interior part of the insertion being between the insertions of the two last muscles. This appears to correspond with the infraspinatus, by the same line of argument; if the coracoid points to the supraspinous fossa, the scapula would point to the infraspinous fossa. Mr. Mivart has called it the second part of the deltoid; but in this animal it has a separate insertion from that muscle. In addition the above arguments in favour of this view, I would draw attention to the arrangement of the insertions of these three muscles, which correspond in a striking manner with the arrangement of the three analogous muscles in mammals.

Biceps is represented only by the coracoid head. It arises, broad and fleshy, from the anterior and inner half of the articular border of the coracoid, and from the surface of bone behind it. In passing over the shoulder-joint it developes a broad thin tendon; beyond that point it again becomes fleshy, and in the arm it is thick and round; it is inserted by a narrow tendon into the upper part of both radius and ulna, in conjunction with and on the distal side of the insertion of brachialis anticus.

Coraco-brachialis brevis arises broad and fleshy dorsad of the last, from the posterior and inner half of the articular border of the coracoid, and from the surface of bone outside it; passing close under the humero-scapular articulation, it is inserted into the inner side of the shaft of the humerus for nearly two-thirds of its length.

Coraco-brachialis longus arises behind this, from the posterior angle of the coracoid bone, and, passing down inside the arm, it is inserted, narrow, into surface of bone immediately above the inner condyle of the humerus.

Brachialis anticus arises from the whole length of the flexor surface of the humerus, commencing beyond the insertion of the supraspinatus, and is inserted entirely into the proximal part of the ulna, together with part of the biceps-tendon.

Trapezius consists of two portions, united together by a thin layer of muscular fibre. The anterior portion arises from the side of the complexus in conjunction with the neuro-mandibularis; the posterior part is attached to the general aponeurosis covering the dorsal muscles, extending back as far as the fourth dorsal vertebra: this part is inserted into the scapula immediately dorsad of the claviculo-scapular articulation; the anterior part is inserted into the upper third of the clavicle.

Latissimus dorsi arises from the spinous processes of the vertebræ, from the seventh, or last but one, cervical to the fourteenth dorsal, both inclusive; the anterior fibres are directed straight downwards, and the posterior obliquely downwards and forwards, to be inserted into the upper surface of the humerus, occupying one-third of its extent beyond the head.

Triceps has four origins, the outer section arising by two heads, one

from the humerus immediately beyond the insertion of the deltoid, the other dorsad of the insertion of the infraspinatus, commencing immediately distad of the insertion of the teres minor. The scapular section, or long head, arises from the posterior edge of the scapula, just above the glenoid cavity, by a flat tendon, which is further strengthened by an aponeurosis, which is attached to the head of the humerus, binding down the teres minor ; the inner section occupies the internal surface of the humerus, commencing beyond the subscapularis, between coraco-brachialis and latissimus dorsi. The united muscular mass of these origins occupies the dorsal surface of the humerus, and is inserted into the proximal extremity of the ulna, developing a sesamoid bone or olecranon in the tendon.

Levator scapulæ arises by two heads, one from the scapula and clavicle, close to the articulation between those two bones, the other from the cartilaginous suprascapular; they pass forwards, and are inserted together into the transverse process of the first cervical vertebra or atlas.

Subscapularis arises from a small part of the outer surface of the scapula covered by the infraspinatus, and from the whole internal surface of that bone, with the exception of the posterior superior angle, and from the interior inferior angle of the suprascapula, also from the upper two-thirds of the inner surface of the coracoid; the fibres converge and are inserted into the inner and lower edge of the head of the humerus, close to the capsular ligament. This evidently corresponds to the subscapularis, and perhaps the dorsal part to the teres major, as it is partially separable from the remainder at its insertion, which is a trifle beyond that of the rest of the muscle.

Sterno-coracoidalis arises from the anterior and lower part of the internal and lower surface of the coracoid, occupying rather more than one-sixth of its superficies, slightly overlapping the edge of the last muscle, and is inserted into the antero-lateral edge of the sternum. Some of its fibres proceed further back, and are inserted into the anterior extremity of xiphisternum and into the cartilages of the second and third sternal ribs.

Serratus consists of two distinct parts. The anterior section arises from the whole length of the suprascapula, and, passing downwards and forwards, is inserted by three slips into the expanded terminations of the three anterior cervical ribs. The posterior section arises from the postero-inferior border of the scapula and suprascapula, and, passing downwards and backwards, is inserted into the extremities of the fourth and fifth cervical ribs. From this there is a continuation in the same direction to the xiphisternum and cartilages of the fourth and fifth sternal ribs, the whole being parallel with the fibres of the obliquus externus abdominis.

Flexor carpi radialis arises from the upper part of the inner or flexor condyle of the humerus, and from the proximal two-thirds of the radius, and is inserted into a bone of the carpus which appears to correspond with the scaphoid.

Flexor carpi ulnaris arises from the lower part of the inner condyle

of the humerus and from the whole length of the ulna, and is inserted into the pisiform bone.

Flexor sublimis digitorum arises from the strong tendinous arch, one end of which is attached to the pisiform bone and the other to the scaphoid, and from the palmar fascia; it immediately divides into five muscular slips, each of which is attached to a tendon of the flexor profundus and to the head of the metacarpal bone of its respective digit; although this is not perforated by the long tendon, it represents the perforatus, as it will be seen, when we come to the foot, that the corresponding muscle there allows the long tendon to pass between its two heads.

Flexor profundus digitorum arises from the middle portion of the inner condyle of the humerus and from the lower two-thirds of the ulna; passing beneath the annular ligament, it becomes developed into a broad expansion, which, in the palm, divides into four long tendons, going to the terminal phalanx of the pollex, second, third, and fourth digits. The fifth digit has a long tendon to itself, which is given off high up in the forearm.

Pronator quadratus arises from the whole length of the ulna, and is inserted into the distal half of the radius, occupying the place of the interosseous membranc.

Flexor accessorius digitorum.—There are four muscular slips which may be thus called; two of them arise from the tendinous expansion of the long flexor, and, forming very fine tendons, are inserted into the last phalanx but two of the third and fourth digits respectively. Two other slips arise from the bone of the carpus which appears to represent the cuneiform, and from others, in the first row; one of these joining the long tendon, developes, in addition, a tendon of its own, which is inserted into the penultimate phalanx of the second digit; it has also a muscular insertion into the base of the first phalanx of the same digit; the other slip is simply attached to the long tendon going to the pollex, without having one of its own.

Lumbricales.—There are five muscles which correspond to the lumbricales—viz. one on each side of the fourth, one on each side of the third, and one on the ulnar side of the second digit.

Abductor quinti digiti arises from the pisiform bone, and is inserted into the whole length of the ulnar edge of the metacarpal bone of the fifth digit.

Abductor pollicis arises from scaphoid, and is inserted into the whole length of metacarpal bone of pollex.

Beneath these there are five palmar interossei, which radiate from the first row of bones of carpus, and are inserted into the heads of the metacarpal bones of their respective digits, one for each.

Supinator longus arises from the lower third of the outer edge of the humerus, above the condyle, and is inserted into the distal twothirds of the radius.

Supinator brevis arises from the outer condyle distad of the last, and is inserted into nearly the whole length of the radius.

Extensor carpi radialis arises from the outer condyle of the humerus next to the last muscle, and, forming a long slender tendon, is inserted into the scaphoid bone of the carpus; it does not quite correspond to ext. carp. rad., but it does so more nearly than to any other extensor of the forearm.

Extensor carpi ulnaris arises by two heads, one from the distal extremity of the outer condyle of the humerus, the other from the proximal half of the ulna; it is inserted into the pisiform bone and the base of metacarpal of the fifth digit.

Extensor communis digitorum arises tendinous from the outer condyle between the last two muscles, and muscular from the whole length of the ulna, as far as its distal articulation; in the middle of the forearm it forms a thick fleshy mass, which soon divides into three broad tendons, which are inserted into the heads of the second, third, and fourth metacarpal bones; the one to the second sends a slip to be attached to the fascia covering the metacarpal bone of the pollex; in another specimen this part was divided into two, giving the appearance of five tendons instead of three.

Interossei dorsales.-Each digit has two dorsal interossei, one on each side; they are inserted into the penultimate phalanx, being united together on the dorsum by a raphe; this is a feature they all have in common. Their origins are as follows :- The one on the ulnar side of the fifth digit arises from metacarpal bone of the same; that of the radial side from the tendon of the extensor digitorum, and also from the same metacarpal bone. The one on the ulnar side of the fourth digit arises from the same tendon with last, and also from its own metacarpal bone; the radial one of this digit from its own metacarpal bone. The one on the ulnar side of the third digit from the middle tendon of the extensor and its own metacarpal bone; the radial one of this digit from the ulnar side of the head of the metacarpal bone of the second digit. The ulnar of the second digit from its own metacarpal bone and extensor tendon; its radial from the metacarpal bone of pollex in conjunction with the single one belonging to the latter.

Extensor ossis metacarpi pollicis arises from the distal end of the ulna for one-fourth of its length, and passing across the forearm it is inserted into the whole length of the radial side of the metacarpal bone of the pollex.

Extensor brevis digitorum arises from the bone of the carpus representing the cuneiform, and immediately divides into five slips; the first passes across the hand to be inserted into the base of the first phalanx of the pollex; each of the other four slips ends in a slender tendon, which is inserted into the penultimate phalanx of each of the other digits.

Complexus is the superficial muscle of the back of the neck. It is a distinct continuation forward of the longissimus and spinalis dorsi, and is inserted into the fascia covering the temporal muscle, into the supraoccipital and neural spine of the first vertebra, and also into the membrane which fills up the space between the parietal and the supra- and exoccipitals.

Trachelo-mastoid is a continuation forward of the longissimus dorsi. It also arises from the zygapophysis of the first cervical vertebra, and from the furrow between the zygapophyses and transverse processes of the two following vertebræ. It is inserted into the lower border and external end of the exoccipital.

Cervicalis ascendens is the continuation forward of the sacro-lumbalis. It also arises from the surface of the second and third cervical ribs, and is inserted into the transverse process of the first cervical vertebra and basioccipital above the insertion of the longus colli.

Sacro-lumbalis arises from the posterior extremity of the ilium, and is attached to all the ribs between the points corresponding to the angles and the insertion of the longissimus dorsi.

Longissimus dorsi begins at the transverse process of the fifth caudal vertebra, interdigitating with the first caudal muscle; it has an attachment to the posterior end of the ilium, and is inserted into the bases of all the ribs between the last muscle and the zygapophyses of the vertebræ as far forward as the fourth cervical.

Spinalis dorsi commences between the inner point of the first caudal muscle and the neural spine of the fifth caudal vertebra, and is inserted into the neural spines of all the vertebræ as far as the fourth cervical, occupying the space between the neural spines and the zygapophyses; a small slip is continued forward beyond the fourth cervical, attached to the neurapophyses of the three anterior cervical vertebræ.

Rectus posticus arises from the neural spines of the second, third, and fourth cervical vertebræ; it is directed outwards, and is inserted into the upper and inner surface of the exoccipital, within and above the trachelo-mastoid.

Rectus anticus major arises from the point of the external apophysis of the basioccipital, and is inserted into the hypapophysis and side of centrum of the first cervical vertebra, and in the same way into the rest as far as the sixth, and into the side of the centrum of the seventh.

Scalenus arises from the side of the centrum of the second cervical vertebra dorsad of the last muscle, and is inserted into the cervical ribs from the first to the fifth, enclosing them in a triangular muscular mass, also into the sides of the bodies of the vertebræ belonging to these ribs; behind it is continuous with the intercostals.

Rectus abdominis arises behind from a tendinous arch extending from the hook-like process of the pubis in front of the femoro-pelvic articulation to the ischium, which might be called ischio-pubic ligament, and is inserted by means of a fibrous membrane into the posterior extremity of the xiphisternum, and into the cartilage of the sixth sternal rib. It has six tendinous intersections running transversely across its fibres and occupying the whole thickness of the muscle. An offshoot is given off just beyond the most posterior intersection, which goes to be inserted into the hook-like process of the pubis; this appears to represent the pyramidalis.

External oblique arises by fourteen digitations, each loosely attached to a rib at the external edge of the sacro-lumbalis; the first digitation belongs to the seventh cervical vertebra, towards the middle line; it is inserted behind to the hook-like process of the

1870.] MYOLOGY OF PLATYDACTYLUS JAPONICUS.

pubis, and in front to the sides of the rectus abdominis; its fibres are directed from behind forward and towards the dorsal surface.

Intercostals are the layer of muscles next internal to the last; they are united behind with the internal oblique and transversalis to form an arch over the external and back part of the thigh; they occupy the spaces between all the ribs from the sides of the rectus and sternum to the vertebræ, anteriorly they are continuous with the scalenus; their fibres are directed forward and slightly towards the dorsal surface.

Internal oblique and transversalis are situated between the ribs and the viscera. Posteriorly they are united together and to the intercostals as above mentioned; dorsad they are attached to the angles of the ribs internally, at the place where the external oblique is attached externally; ventrad they are attached to the side of the rectus abdominis, and, in front of that, to the end of the fourth sternal rib, to the xiphisternum, and to the postero-lateral edge of the sternum. Anteriorly they extend as far as the fourth cervical rib. The fibres of the internal oblique are directed obliquely forwards and towards the ventral surface; those of the transversalis go transversely across the body.

Quadratus lumborum arises from the anterior edge of the sacrum. It is attached to the sides of six lumbar and the last dorsal vertebræ, and encloses all the lumbar ribs in a thick muscular mass, which terminates anteriorly at the last dorsal rib.

Retrahentes costarum line the whole dorsal surface of the abdominal cavity in front of last muscle. They consist of muscular slips separable by dissection, each arising from a centrum of a vertebra, and passing ventrad of the rib of its own vertebra; and that of the next one in front is inserted into the next but one, interdigitating with the transversalis and internal oblique; the most anterior one is attached to the centrum of the first dorsal vertebra and to the fourth cervical rib, and the last to the twelfth dorsal.

Sartorius occupies the greater part of the ventral aspect of the thigh. It arises from the hook-like process of the pubis in front of the acetabulum, also from the whole length of the ilio-pubic ligament; it has a broad muscular insertion into the lower or inner side of the tibia, occupying one quarter of its proximal end.

Gracilis arises from the side of the ischial symphysis and from the ventral part of a tendinous intersection which connects the posterior point of that bone with the posterior end of the ilium, and which seems to represent the tuber ischii; it is inserted partly tendinous and partly fleshy into the tibia, beneath the last muscle.

Transversus perinei is a small muscle in front of the cloaca, arising from the proximal side of the above-mentioned tendinous intersection, and is inserted into a cartilaginous rod attached to the posterior end of the ischium, and into the skin anterior to the cloaca.

Semimembranosus arises from the tendinous intersection dorsad of the gracilis, and is inserted into the tibia on the inner side of the internal lateral ligament, and nearer the head of the bone than the gracilis. There are two separate muscles which, perhaps, represent the ligament of Winslow and the poplitcal aponeurosis: the one arises from the tendinous intersection in common with the semimembranosus, and is inserted by a long tendon into the external side of the head of the tibia, between it and the head of the fibula, in immediate contact with the joint; the other arises from ischium, in front of and close to the last, and is inserted by a shorter tendon into the interarticular cartilage of the joint.

Semitendinosus arises, in conjunction with semimembranosus, from the tendinous intersection, and is inserted by a broad thin tendon into the head of the tibia.

Pelvo-tibialis arises from the edge of the pubis at a point behind the hook-like process of that bone, to which it is attached by a strong aponeurosis, and passing obliquely across the thigh it reaches the popliteal space, where it suddenly becomes tendinous and penetrates the knee-joint, being inserted into the head of the tibia between it and the fibula, external or anterior to the attachment of the section of semimembranosus mentioned above. This appears to correspond in insertion to the muscle called "biceps" by Mr. Mivart; but in this animal it is quite on the ventral aspect of the thigh; so I have ventured to give it a distinct name.

Pectineus arises by a membranous expansion, attached to the anterior point of the ischial symphysis and to the ischio-pubic ligament, and is inserted into the ventral surface of the shaft of the femur, occupying about the middle third.

Rectus femoris arises by two heads :—one from the surface of the pubis immediately anterior to the cotyloid cavity, and from the capsule of the hip-joint; and the other from a varying extent of the ilium, in this case from two-thirds of its length. They join together and form a fleshy mass covering the anterior and dorsal surface of the thigh; the whole is inserted into the tuberosity of the tibia by means of a tendon containing a sesamoid bone. Being unable to decide whether the iliac origin of the muscle represents the gluteus maximus or not, I have preferred to leave the text as it has been written.

Biceps femoris arises from the ilium immediately behind the superior origin of the rectus; it is inserted into the fibula on the proximal side of its central point by a flat tendon, which is covered by the peroneus brevis.

Coccygeus.—There are three muscles which have attachments corresponding to this muscle. The one which may be called *superior* arises from the extremities of the transverse processes of the five anterior caudal vertebræ, and is inserted into the posterior extremity of the ilium; it has two interdigitations with the first caudal muscle.

Coccygeus medius arises from the sides of the six anterior caudal vertebræ ventrad of the transverse processes, and is inserted into the tendinous intersection internal and behind the semitendinosus, its anterior border forming a straight line from that point to the first caudal vertebra. In the Iguana Mr. Mivart calls this the pyriformis; but here it has not the slightest attachment to the femur, and so could hardly represent that muscle.

1870.] MYOLOGY OF PLATYDACTYLUS JAPONICUS.

Coccygeus inferior arises from the hæmal spines of the third, fourth, and fifth caudal vertebræ, and is developed into a broad vertical tendon attached to the centra of the first and second caudal vertebræ, and to the sacrum, which with its fellow of the opposite side forms a partition between the two halves, embracing and being attached to the posterior end of the cloaca; the anterior extremity of the free edge of this tendon is inserted into the postero-external angle of the ischium.

Pyriformis is situated between the coccygeus medius and inferior, arises from the centra of the first six caudal vertebræ, and from the hæmapophyses of the third, fourth, fifth, and sixth, and passing forward through the tendinous intersection it ends in a flat tendon, which winds round the trochanter, and is inserted into the femur at its base on the anterior surface; before arriving at the femur it gives off a long and slender tendon, which passes down the thigh to join the aponeurosis covering the flexor muscles of the leg.

Quadratus femoris arises from the posterior point of the ilium, between the origin of the biceps femoris and the insertion of the coccygeus superior; passing directly towards the ventral surface, it joins the tendon of the last muscle, and in addition is inserted into the posterior edge of the trochanter by a tendon of its own.

Iliacus arises from the concave ventral surface of the pubis and from the membrane, filling up the space between it and the ischium; superficially it is divisible into three portions; but the divisions do not run deep; the fibres converge and are inserted into the summit of the trochanter, having somewhat the aspect of the subscapularis. I have ventured to call this iliacus on account of its insertion, its origin, although coming from the proper direction, being from a different bone to the one it ought to be in order to make the analogy complete.

Adductor brevis.—This muscle regarded superficially looks as if it formed part of the iliacus; but dissected deeper it is found to have a separate insertion; it arises from the side of the ischium, and is inserted into a fossa on the dorsal side of the trochanter, internal to the insertion of the quadratus femoris.

Capsularis arises from the postero-lateral margin of the ischium, covered by the last muscle, and is inserted into the dorsal part of the capsular ligament of the femoro-pelvic articulation.

Adductor magnus arises on the internal or dorsal surface of the pelvis by three heads :—one from the anterior border of the ischium; the other from the internal surface and anterior edge of the pubis, appearing on the ventral aspect; the other from the membrane between the two bones. The fibres converge, and passing over the front of the ilium through the arch formed by the abdominal muscles are inserted into the ventral aspect of the shaft of the femur for nearly one-half of its length, ventrad of the crureus and dorsad of the pectineus. The action of the muscle being to adduct and flex the thigh upon the pelvis, it seems more nearly to correspond with the adductor than with any other.

Gluteus medius arises from the ilium, in front of the origin of the

biceps femoris, and is inserted into the dorsal surface of the femur dorsad of the crureus, on a line corresponding to the insertion of the last muscle; in its course it is situated in close juxtaposition to the capsular ligament of the hip-joint.

Vastus and crureus.—The externus arises in intimate fusion with the crureus; it commences narrow immediately behind the head of the femur, between the insertions of the adductor magnus and the gluteus medius, and covers the outer and upper surface of the bone. The internus is smaller, and arises from about half the ventral surface of the femur. They are inserted with the rectus into the patella.

Extensor tarsi arises from the middle half of the tibia, being superficial to all the other muscles of the flexor side of the leg; it crosses the limb obliquely, and is inserted into the base of the meta-tarsal bone of the fifth digit, and fascia covering the tarsus.

Flexor perforatus arises narrow from the fibular condyle of the humerus, and, forming a broad muscular mass in the leg, it is inserted partly tendinous and partly muscular into an apophysis of the cuboid bone of the tarsus, and is continued into the plantar surface of the foot by means of five muscular fasciculi, which are inserted into the metatarsal bones by two heads, between which the long flexor-tendons pass; the one belonging to the fourth digit is also inserted into the base of the first phalanx; that of the fifth has in addition an attachment along the whole length of its metatarsal bone.

Flexor longus digitorum arises from the peroneal condyle of the humerus in conjunction with the last, and also from the interarticular cartilage of the knee-joint, also from the proximal half of the fibula; it is inserted into three-fourths of the length of the tibia, which part, perhaps, represents the popliteus. Continuing down the leg it developes a broad tendon, occupying the plantar surface of foot, dorsad of the last; here it divides into four long tendons, which are inserted into the terminal phalanx of the pollex and of the second, third, and fourth digits; the long tendon belonging to the fifth digit is given off from the muscle about the middle of the leg, and, passing round the projecting apophysis of the cuboid, goes to the terminal phalanx of that digit.

Flexor accessorius digitorum.—There are four muscular slips which may be collectively called by this name. The one belonging to the fourth digit arises from the tendon of the long flexor going to that digit, and gives off a tendon of its own inserted into the base of its third phalanx; the slip belonging to the third digit arises from the cuboid bone; those of the second and hallux from the cuneiform (these join the long tendon); those of the second and third digits have in addition slender tendons, which are inserted into the second phalanges of those digits.

Lumbricales.—There are five—one on the peroneal side of the second digit, one on each side of the third digit, one on each side of the fourth digit.

Adductores digitorum form the third layer in the sole of the foot. They consist of four muscular slips arising from the cuboid; three cross the plantar surface and are inserted into the peroneal side of the base of the first phalanx of the hallux, and of the second and third digits; the fourth is inserted by two heads, one of which goes to the head of the metatarsal bone, and the other to the side of the first phalanx of the fourth digit.

Interossei plantares.—Four in number; three fill up the spaces between the metatarsals of the first three digits, the fibres going obliquely from the fibular to the tibial side; the other arises from the cuboid and goes to the metatarsal bone of the fourth digit without entirely filling up the space.

Tibialis anticus is visible both on the flexor and extensor sides of the leg; it arises from the surface of the tibia for nearly its whole length, and is inserted into the metatarsal bone of the hallux.

Peroneus longus arises from distal half of the fibula on the flexor side, and is inserted fleshy into the cuboid close to its articulation with the fifth digit; from this it gives off a broad tendinous expansion, which is inserted into the cuneiform bone, covering the tarsus beneath the flexor tendons; from its extreme point on the tibial side arises a small muscle, which is inserted into the head of the metatarsal bone of the hallux.

Peroneus brevis arises from the distal two-thirds of the outer surface of the fibula, and is inserted into the cuboid bone of the tarsus; it also sends a tendon to the back of the foot, which is inserted into the extremity of the metatarsal bone of the fourth digit.

Extensor longus digitorum arises from the anterior aspect of the peroneal condyle of the femur by a flat tendon; it forms a thick belly in the leg, partially divisible into two, and ends by two flat tendons, which are inserted into the metatarsal bones of the second and third digits. If this muscle were situated in the forearm it might be called ext. carp. rad. long. et brev.

Extensor ossis metatarsi hallacis arises from the distal end of fibula, and crossing the tarsus is inserted into the whole length of the tibial side of the metatarsal bone of the hallux.

Extensor brevis digitorum arises from the peroneal side of the bone of the tarsus corresponding with the united astragalus and calcaneum. It consists of four radiating fasciculi: the first crosses the foot and ends in a tendon, which is inserted into the penultimate phalanx of the hallux; the second is inserted in like manner into the penultimate phalanx of the third digit, the third into the third phalanx of the fourth digit; the fourth fasciculus is intimately united to the dorsal interosseus of the fifth digit, its tendon being inserted into the second phalanx of that digit.

Interossei dorsales. — Two muscles arise together from the dorsal surface of the metatarsal bone of the hallux : one goes to the tibial side of the hallux, being inserted into the whole length of its metatarsal bone and phalanges; the other goes to the tibial side of the second digit. The interosseus of the fibular side of the hallux arises from the tibial side of the metatarsal bone of the second digit. Two muscles arise together from the dorsal side of the second metatarsal bone : one forms an extensor for that digit, and is inserted by a long tendon into its penultimate phalanx; the other forms an interosseus for the tibial side of the third digit; this latter arises in addition from nearly the whole length of the metatarsal bone of the second digit. The interosseus for the fibular side of the second digit arises from a small portion close to the head of its own metatarsal bone, left unoccupied by the last muscle; the one for the fibular side of the third digit arises from the whole length of the same side of its own metatarsal bone; the one for the tibial side of the fourth digit arises from the same side of its own and the base of the metatarsal of the third digit; that of the fibular side of this digit arises close to the head of its own metatarsal bone on the same side. The interosseus of the fibular side of the fifth digit arises from the cuboid; that of the tibial side from the extremity of the fourth metatarsal bone and from the whole length of its own. These are all attached to the sides of the phalanges of their respective digits, uniting together over the dorsum, and are inserted into the penultimate phalanx, precisely in the way that occurs in the hand.

7. Notes on the Skeleton of a a rare Whale, probably identical with *Dioplodon sechellensis*. By GERARD KREFFT, C.M.Z.S., F.L.S., &c.

A few days ago I purchased for the Australian Museum the nearly perfect skeleton of a small Whale, which I believe is the *Dioplodon sechellensis*, whereof the skull and lower jaw only have been yet known. The specimen is not yet cleaned; but I do not wish to delay giving a short account of the number and size of its vertebræ and ribs. The total length of the skeleton, without cartilage, is 14 feet 8 inches; the head measures 2 feet $5\frac{1}{2}$ inches in length, and the lower jaw 2 feet 3 inches in length. The first three cervical vertebræ are anchylosed; the next one is more or less free; and the remaining three are anchylosed again. The dorsals are ten in number, the last bearing a short rib 8 inches in length. Five of these ribs are jointed direct to the sternum; the following two meet the cartilage of the fifth rib.

The sternum is composed of four pieces 20 inches long, with a width of between 5 and 7 inches. It is not yet sufficiently cleaned to enable me to have it photographed; this, however, will be done as soon as possible, and copies forwarded to the Society. The lumbars number twenty, the last nine having V bones attached. The fifth lumbar is $17\frac{1}{2}$ inches high, 4 inches wide at the top, and $11\frac{3}{4}$ inches at the base, including the side processes. The eleventh lumbar is the widest, being $4\frac{3}{4}$ inches at the top.

The caudals probably amounted to 13; but five of these are missing; the base one is very small, about the size of a pea; and as it was firmly attached to the second last, there can be no mistake about it.

The head is 2 feet $5\frac{1}{2}$ inches long and 14 inches across at the widest part; the lower jaw 2 feet 3 inches long and $6\frac{1}{4}$ inches high

behind the tooth. The left tooth measures 6 inches in length, $3\frac{3}{8}$ inches in width, and is $1\frac{3}{4}$ inch thick. The space between the teeth measures $7\frac{1}{4}$ inches. The limbs are very imperfect; all the smaller bones are missing; and there is only a part of one scapula. I did not find the pelvic bones.

This animal was captured about a year ago, near Lord Howe's Island.

8. Zoological Notes of a Journey from Canton to Peking and Kalgan. By R. SWINHOE, F.Z.S.

On my return from Hainan in April 1868 I visited Canton. In the market there three species of White Herons (*H. alba*, *H. garzetta*, and *H. intermedia*) were to be seen, with eyelids stitched together, walking about the connters of the bird shops—the bills of the first and last in different stages of black and yellow, changing from the winter to the summer colour—all with the nuptial plumes fully developed. Parrakeets with red cheeks (*Palæornis longicauda*?) were in abundance. The dealers told me that they were brought from the western portion of the province, down the west river. *Polyphasia tenuirostris* was often heard whistling in the neighbourhood. It has a quick undulatory flight as it flits from tree to tree, and has two other series of notes besides its ordinary call.

We pulled down the river and went on board a Customs' revenue cruizer to call on a Mr. S. Bligh, formerly a naturalist in Norfolk, who was serving on board. He had a tolerable collection of neatly prepared skins made on the Canton river. He had fine specimens of both Herodias alba and H. intermedia; and drew my attention to the fact that the latter lacked the pink garters which the former carries on the top of its bare tibiæ. He had also a large Goose with flesh-coloured bill and white dertrum and yellowish flesh-coloured legs; tail broadly margined with white, and belly blotted with black; apparently a race of Anser ferus. He had besides several of Totanus fuscus, L., which he assured me was very common during winter on the Pearl River. The best thing I got from him was a solitary specimen of a new species of Porzana, which I have lately described in the 'Annals and Magazine of Natural History' (March 1870, p. 173) as Porzana mandarina. He showed me a Calamoherpe orientalis (T. & S.), which he said was just beginning to arrive. There were certainly plenty of Reed-warblers about then ; for the river-banks resounded with their notes. Mr. Bligh believed that both Anas circia, L., and Anas zonorhyncha, mihi, breed in the neighbourhood of Canton.

The Commissioner of Customs at Canton had a nice aviary, with several birds of interest in it. Of domestic things, the most curious was a full-grown Duck (cross between a Muscovy and the common Chinese or Penguin Duck) of a piebald colour, with *four* legs. The foremost pair were normal; the hind pair hung obliquely backwards soles upward, and shook up and down with every movement of the bird, having apparently no muscular power. Among the wild captives were a pair of my Porphyrio calestis from the Canton neighbourhood, and a Pelican (P. minor, Rüpp.) with vellowish bill and legs, which had lived in the aviary for two years or more but still retained the grevish-brown markings to its feathers. It sat for the greater part of the day on a perch, with its head back and its bill on its breast. There was another bird, which interested me most of all; and that was an Ibis said to have been winged on the Canton river. I noticed at once that it was my undetermined friend of Talienwan (Ibis, 1861, p. 261). It was very like Ibis religiosa, having, like it, a purplish-black bill, bare head and neck, the latter not bare to such an extent; entire plumage white, lacking the black tips to the wings and the desiccated purple plumes that adorn the back of the other. Its pectoral feathers were long and pointed, like in Herodias garzetta. It was about the size of I. religiosa, and had similar legs. I could not handle the specimen, and canuot, therefore, give measurements. I before supposed the Chinese species to be the Indian representative of the Egyptian sacred fowl I. melanocephala (Linn.) (P. Z. S. 1863, p. 60); but Jerdon's description (B. of I. iii. p. 768) shows that to have black quills. There seems no doubt, therefore, that our species is a novelty ; and I would propose to recognize it as Ibis propingua. The live specimen in the aviary at Canton, as I have just noted, did not show the peculiar dark decomposed scapulars and tertials of the two allied species, nor did the birds which I saw in Talienwan.

On my way up from Hong Kong to Shanghai, off Video Island (near Shanghai), I saw (15th May) a Black Petrel the size of a Duck, and a small flock of Guillemots. A Swallow followed us for the greater part of the day; and a Lanius lucionensis, Strickl., flew on board. In the grounds of the Shanghai Consulate they have a very fine pair of Grus montignesia, Bp., that have the run of the place. They are very tame and bold, and have lived there many years. I saw them on my first visit to Shanghai in 1858. In the bird-shops of Shanghai there were plenty of White-eyes (Zosterops erythropleurus, mihi), Pihlings (Alauda mongolica, Pall.), and Hwameis (Leucodiopterum sinense, L.)-also numbers of Suthora webbiana, G. R. Grav, caged separately and kept for fighting. The domestic Cormorant was also offered for sale, and the bodies of some small shore birds, from strings of which I was glad to secure *Ægialites* geoffroyi (Wagler) and Eg. mongolus (Pall.) in full summer plumage. A friend showed me a collection of fossils purchased at Shanghai. He had some fine Orthoceratites obtained from the curiosity-shops; the Chinese believe them to be natural photographs of pagodas. His collection of fossil teeth were procured at the druggists, where they are sold for medicine. Shanghai is a great centre for this trade; and the raw article can be procured here in quantity. In other large towns you can only get the prepared drug in a calcined state. These fossils are called Lungche, or "Dragon's teeth ;" and the idea about them is that in olden time the world consisted of monsters who were incessantly fighting and killing one another, until man came on the scene and initiated a more peaceful state of things by clearing the country and cultivating it. The monsters were large and powerful brutes; and in their teeth and bones existed their strength; hence the remains of these ground to powder and taken internally must give strength to the weak invalid. For the same purpose Tiger's bones are also in favour. Mr. Kingsmill had managed to get together a very nice series. He had also specimens, chiefly of fossil plants, of his own collecting.

At Chefoo, on the 21st of May, all the Gulls I saw about the harbour were Larus melanurus, Temm. et Schleg.

About Tientsin, on the 25th of May, Swifts were abundant.

On the 27th I arrived at Peking, and learned, to my great annovance, that Père David had left the same morning for Tientsin on his way south. He was bound on a three years' exploring tour into Szechuen, bordering Thibet. I had counted on his assistance in working the northern birds, and his departure was a great blow to me. I nevertheless lost no time in visiting the Lazarist mission called Paitang, near the north-west gate of the Tartar city. The priests were very polite and courteons, and led us to the museum; but none of them knew any thing about the treasures it contained : the soul of the place was gone. We were escorted into a building on the left of the cathedral; and judge of my surprise when I found myself in a large room with glass cabinets all round and glass-faced tables up and down the middle, as neatly got up as in any museum in Enrope. Three sides of the room were devoted to birds and mammals, the cabinets being divided by horizontal shelves, on which were placed specimens elegantly mounted on stands. The fourth, or side through which we entered, exhibited astronomical and other instruments, and an assortment of minerals. The tables contained Butterflies and Beetles pinned and arranged. The zoological specimens were for the most part from the neighbourhood of Peking, and had been collected by the Père Armand David. The zeal and enthusiasm of the Abbé for scientific pursuits must indeed be great to have enabled him to accomplish all we saw before us, in a remote place like Peking, in the space of four and a half years; and how commendable the liberality of a religious mission to give so much space, labour, and money for providing a kind of instruction to the youths of their school which in England and Europe generally is considered of a very secondary and even unnecessary character! I trust many of the Chinese pupils will be won over by the attractions of the museum to the study of the natural history of their country; but I fear it is a vain hope. The priests told us that the natives took very little interest in the prepared specimens. I paid during my stay in Peking three visits to the museum. The priests were surprised at my coming so often; but I could have spent weeks there to advantage. All the species that Père David had collected were not there. They told me that he had sent large collections to Paris, and that none remained but those here exhibited. How I longed for the worthy

PROC. ZOOL. Soc.-1870, No. XXIX.

Father himself to go over his treasures with me. I jotted down a few notes, which I will here insert.

A very fine series of Eagles and Hawks; and among the former a large *Gypaëtus barbatus* with pale underparts. A female *Cercus melanoleucus*, of a rich brown colour.

Troglodytes europæus (?). Apparently the same as the Japanese species, T. fumigatus, Temm.

Pericrocotus brevirostris, so marked.

A Redbreast with red head and neck, with black line across breast, grey sides, red tail; Robin green above, with white belly = Lusciola akahige of Japan.

Lanius excubitor, var., in different stages of plumage.

Lanius phænicurus, with the head dull brownish, forehead grey = L. lucionensis; and one specimen of the species I have lately described from Szechuen as L. waldeni (P. Z. S. 1870, p. 131).

A Warbler from Mongolia, like Sylvia curruca, with black earcoverts and whitish outer tail-feathers, marked Sylvia cinerea.

Locustella certhiola (Pall.), from the neighbourhood of Peking; and a Warbler from the same locality like Nisoria undata, Bp., but much less banded on the underparts.

Passer ouratensis, with black round the bill and down the threat, from the Oulashan; also Passer petronius, L.

Mecistura ouratensis. Two young examples from Oulashan.

Parus ouratensis. An ugly dusky-backed species with a black crown, also from Oulashan (=P. sibiricus).

One specimen of my new Ægialites hartingi (P. Z. S. 1870, p. 136).

Another large Sand-plover, with white head and neck, red breast succeeded by a black band, white belly; above brown. This I take to be the full summer plumage of *Charadrius veredus*, Gould.

The most interesting thing in the collection, of which M. David had procured but the single example mounted in the Peking Museum, was a peculiar Swan, bought in the flesh in the market at Tientsin. M. David did not acquire a duplicate; and it has therefore not been forwarded to Paris. The priests at Paitang gave me permission to describe it; and as it is such a remarkable species I regard it as a duty to make its existence known to the Society. It is smaller than Cygnus bewickii, Yarr., with the neck about a third shorter, is entirely white, with the bill vermilion colour having a black dertrum, and the legs and feet orange-yellow. Specimens of C. musicus and C. bewickii were ranged alongside. Its nearest ally, of course, is C. coscoroba of Chili; but it is larger than that, and has the wing white throughout. It would appear to be the northern representative of that curious form of Swan; and I would propose to name it, in honour of its discoverer, as the Cygnus (Coscoroba) davidi, n. sp.

The mounted Mammals were : —An adult and a younger sample of a Leopard from the western hills—doubtless the *Leopardus chinensis*, Gray, founded on skulls brought from Peking by Dr. Lockhart (P. Z. S. 1867, p. 264), which, from skins of old and young brought home by myself, I showed to be the same as the *L. japonensis*, Gray, P. Z. S. 1862, p. 262 (vide P. Z. S. 1870, p. 4).

Cervus capreolus, L., var. pygargus, Pall. A specimen without horns, white rump and tail; from Pechili (the province in which Peking is situated). The French legation had a number of these alive, and they bred in confinement. The British legation had a couple of bucks. They are small Deer, of a deep yellowish-brown colour finely speckled with black, the rump marked as before said. Their horns are covered on the beam with short spinous processes.

A long-tailed *Capricornis* from the western hills.

Antilope gutturosa, Pall., from Mongolia.

Lepus tolai, Pall., from near Peking.

Gerboas from Seuen-hwafoo (marked Dipus jaculus, Pall.).

An olive-brown Squirrel (marked Myoxus cinereus).

A Badger very white about the neck.

A small Arvicola, $3\frac{1}{2}$ inches long, 1 inch tail; back red, with black dorsal line; sides and underparts white.

Mustela sibirica, M. foina, and light-brown Mole-rat.

Mus decumanus, M. minutus, and a Hedgehog.

A Spermolegus marked as a Cricetus.

A small short-tailed Fox.

A kind of Wild Cat closely allied to *Felis catus* of Europe.

And a fine pair of horns of Elaphurus davidianus.

These were all the Mammals exhibited. M. David must have consigned most of his collections in this branch to the Paris Museum.

The dust and heat were insufferable; and the great city is of such a huge extent that there was no getting out of it for a run into the fields without making a day of it. I was tired of watching the Rooks and Sparrows disporting themselves among the trees of the legation, and the myriad Swifts that were constantly skimming the air above, and of listening to the melancholy moaning of the Pigeons that flew in flocks round and round. (The Chinese attach little hollow gourds, or light reed-pipes slit at their tops, to the base of the Pigeon's tail. These face the wind and produce æolian music as the bird flies. In every flock two or three Pigeons carry these whistles.) Closed in by its lofty walls, one feels buried in Peking. It requires a gale to make a free circulation of air; and then the dust overwhelms you and penetrates every part of your person and every nook of your house. To lay the dust many of the main thoroughfares are watered with human urine for lack of water. One longed for wings to rise above the close and unwholesome atmosphere, and envied the Swifts.

On the 2nd of July I was enabled to find relief in the western hills, where large temples abound, situated at all heights, in picturesque places, and where among the trees and grassy slopes the cool breeze searches you out and makes you feel a different being. The Europeans in Peking find life insupportable in the city during the great heat of the summer; and most of them spend the greater part of that season among these hills—parties of them uniting and fitting up the native temples. Some go to the nearest hills (twelve miles

west of the city), others further westward. The diplomatic corps of the various nations, and even the missionaries, all retreat, the junior members of the legations taking it in turns to reside in town to report on occurrences and to keep up communications. Thus by the end of June the members of the British legation had migrated to their summer habitat; and I was glad to avail myself of an invitation to follow. The temple I visited on this occasion was the Black-Dragon Temple, over the first range of hills to the left of the gardens of the Summer Palace, and about twenty miles from the legation in Peking. The Black Dragon is the deity the Chinese appeal to on occasions of great drought; and such an occasion had occurred before my arrival in Peking. The mandarins were in great trouble because the heavens proved obstinate. They prohibited the slaughter of animals for food and tried every form of prayer, but in vain. At last one of the wise men suggested that the ancient manner of appeasing the wrath of the Black Dragon was to offer him a Tiger's skull. Peking was searched for the article; but the medicine shops had it only in the form of powdered drug. The Inspector-General of Customs asked if a Tiger's skin would do as well, as he had one which he would sacrifice for the purpose. Nothing but a skull was acceptable. At last one was secured, and with great ceremony carried to the temple and sunk in the pretty pool overshadowed by trees within its walls. In the evening clouds began to gather, and the next day there were copious and refreshening showers. I was in hopes of finding this skull, as I was very anxious to get a skull of the northern Tiger in order to determine whether it be the same species as that of Bengal; but some one had been before me, the skull was gone.

On our way outside the Tihshing Mên, or "Gate of Victory" (the gate the British troops occupied in 1860), we came upon a large patch of reeds and rushes with its noisy inhabitants. They consisted of two species of reed-birds-the Calamoherpe aëdon (Pall.), and a smaller bird something like our Reed-wren. The latter was very abundant, chattering in all directions; but it was not easy among the reeds to procure specimens. I shot a female; and, judging from her bare belly and worn appearance, she must just have left the nest. The male hopped down a rush to look at her; and several others appeared, to learn the cause of the disturbance. Before I had reloaded they had all retired again. I had not more time to devote to The specimen procured is a Reed-wren allied to Calamothem. herpe arundinacea, Gmel., and C. dumetorum, Blyth, in colour, but may at once be distinguished from the former by the band of dingy cream-colour that crosses the loral space extending from the nostril to the eye,—and from the latter by its white throat and breast; it has a thicker bill, shorter wing with longer first primary and different proportions of the other primaries, more graduated tail, and paler legs. I will introduce it as the

CALAMOHERPE CONCINENS, sp. nov.

Upper parts olive-brown; lore cream-white; cheeks and sides of

neck light ochreous brown; wings and tail light brown, edged with reddish olive-brown; underparts, axillaries, and carpal edge creamwhite; under edges of quills light salmon-colour; tibials and vent yellowish brown; bill brown on upper mandible, ochreous on lower; legs ochreous flesh-colour, browner on the toes, with brown claws.

Length 5.2 inches. Wing 4.1, first primary measuring .55 in length and being .8 shorter than the second, which is .2 shorter than the third, which is .05 shorter than the fourth, which is slightly longer than the fifth and the longest in the wing. Tail 2.3 inches, much graduated, the outer rectrix being .5 shorter than the middle; subcaudal coverts fall .85 short of end of tail. Bill in front .45, to rictus .67. Tarse .84. Outer toe rather longer than the inner; middle toe .5, its claw .21; hind toe .33, its claw .25.

On the 2nd of July we walked across the valley to the range of hills about six miles distant, to a magnificent temple called *Tacheo-sze*, where the Prussian legation had temporary quarters. The Lark of these intermontane valleys is a crested species—the Galerida leautungensis (mihi). They rose on all sides about us, making the country resound with their short sweet notes. They seldom rose more than forty or fifty yards from the ground. Their more frequent custom is to sing on the ground; and then their notes have quite a ventriloquistic effect. This was their breeding-season, and they were very merry. I saw them dusting themselves in the road as Skylarks are wont to do. The other conspicuous bird of these valleys is the Black Drongo, Dicrurus macrocercus (Vieill.). The willow is the chief tree; and among the groves of them the Black Drongo shares habitancy with the Sparrow, Passer montanus (L.). A pair of the former had a nest on the slender top twigs of a willow; one bird was sitting, and I watched its mate relieve it and take turn. Large numbers of natives passed, carrying baskets of apricots and peaches; the former were nearly out of season, the latter just coming in. Damsons were also appearing. Siskins, (Chrysomitris spinus), were breeding among the apricot-orchards around Tacheo-sze; and Goldenwings, Chlorospiza sinica (L.), old and young, were flitting about in small parties. On a mound by the side of a trickling stream in the woody hill-side I noticed a Wood-Wagtail, Nemoricola indica (Gmel.), pulling at a worm. It would not be disturbed by my approach. I had several opportunities of watching this bird, as it spends its summer among these western hills. It raises and depresses its tail slowly. It sings from the bough of a tree, moving the hinder part of its body from side to side; its song consists of a long wailing whistle-note, which it sometimes doubles. In flying it rises up and down, but utters no note with every jerk as do the true Wagtails. It is extremely tame. I did not find its nest.

On the 6th of July we visited a large cave about a mile from our temple. It is on the side of a low hill which stands alone. Its mouth is about 20 feet in diameter, opening into an abyss floored with broken rocks, among which water has collected. Its internal dimensions are large; but it offers no means of entrance. Along the

[June 9,

walls of its interior the rock was broken into shelves; and here the Rock-pigeon (*Columba rupestris*, Bp.) resorted in hosts to rear its young, and find a cool retreat from the noonday sun. A shout and a few stones thrown in brought them out in swarms. The Sparrow, of course, also availed itself of so satisfactory a site. A pair of Kestrels had a nest on the cliff overlooking the hole; and several species of Hawks were about. In this neighbourbood I also observed Choughs, *Fregilus graculus* (L.). Their peculiar, loud, discordant notes were quite enough to inform you of their approach.

On the 7th we got donkeys and crossed the hills, making southeastwards to the temple Ling-shan-sze, where the British minister resided. This is a very fine temple, situated on a lower slope of the range that faces Peking, and commands a fine view of the plain with the great city in the distance, and the lower wall to the south of it enclosing the Nan-Haitsze, or "Southern-Marsh" hunting-grounds of the Emperors, celebrated among zoologists as the only known habitat of the Elaphurus davidianus. To the north can be traced the various parks and gardens of the Emperor's summer abode, in which are confined the Cervus xanthopygus, M.-Edwards, the C. mantchuricus, mihi, and the Capreolus pygargus (Pall.). To the latter Europeans can get admission; but the "Southern Marsh" is closed against them : it is of large extent, and has east and west gates, at both of which troops are quartered. Foreigners have taken these guardians by surprise, and ridden in before they could close the gates. But beyond the barracks of the household cavalry there is nothing to be seen but low woods and marshy places-in fact, a neglected expanse abandoned to the Elaphurus, some few Cervus mantchuricus, and Antilope gutturosa, Pall. Being informed of the interest the Society took in this animal by its indefatigable secretary, Sir Rutherford Alcock moved one of the high ministers to procure him some of the fawns alive. Four were obtained, but they were so shaken by the cart that conveyed them to the legation that one died. The mandarin sent a fifth. The minister desired me to look after them, and I had left them in the legation doing well; but the day after my arrival at Ling-shan-sze word came that another had died; and on the 9th I was on my way back in a cart to the city, which I reached after a five hours painful jolting. The young Elaphuri were being fed on milk and bran accompanied with fresh-cut grass; two of the three survivors were suffering from diarrhœa, and a third died. I was in despair, as the remaining two looked sickly. At last I observed how fond the two living Capreoli in the legation were of sprigs of the elm that abounded in the grounds, and I tried my young charges with that. They enjoyed it and began to brighten, and I had no more trouble with them. The elm-branches were given to them as daily dessert; it was the over-feeding on damp grass that was killing them. The young *Elaphuri* came into our hands when they were about six weeks old. They had a very calflike look, and were very unsteady on their legs. Their tails were not, as in the adult, merely tasselled at the end like a Donkey's, but were covered with hair uniformly bushy throughout. Their coats were of a deep yellowish brown or fawn-colour, spotted all over with large spots of white. As they grew older the spots began to disappear, and the hair to grow longer and browner. When I left Peking in October scarcely a trace of spots was left, and the animals were steadier on their legs, but still gawky and awkward. I congratulate the Society on having got buck and doe both safe and alive in the Gardens.

Fairs are held twice a week at different temples in the city, and are attended by large numbers of well-dressed people. The booths are neatly got up; and there is always a good display of toys, nicknacks, and flowers; but I did not see much to attract in the bird line. A few of the Chinese pet-birds were offered for sale, and these either young or in bad plumage. Some are shown in cages, others attached by a slipstring to a stick with a metal point at its end for planting in the ground or in a flower-pot. One of their curiosities was an albino Lanius bucephalus.

On the 25th of July I observed that all the Swifts that were breeding in the roofs of the various buildings in the legation had cleared out their young and deserted their nest-holes. In passing the western gates of the Chinese city, of the thousands that swarmed like bees round their turrets a few weeks ago not one was to be seen on the 28th of July. In the morning and evening many still sported about at this date in the air over the legation grounds. The young leave their nests without any loitering or trying of wings; but for some time their parents feed them on the wing. The old birds are fond of screeching as they fly, especially in cloudy weather. Heavy rain closed July; and on the return of fine weather (8th of August) not a Swift was to be seen; the myriads that swarmed in the air of Peking during the fearful dry heat of July had all disappeared. This accounts for my not having met with them on my former visit to Peking in the autumn of 1860; they had left before we arrived. No House-martin (Chelidon) frequents the city; and I only once saw a couple passing over when out on a trip in the country. Hirundo gutturalis, Scop., and H. daurica, Pall., are the only Swallows that court the protection of the Pekinese householders, while Cotyle riparia (L.) enlivens their river-banks. The Swift is closely allied to our home friend Cypselus apus, L., but differs sufficiently to be distinguished as an Eastern race :---

CYPSELUS PEKINENSIS, Sp. nov.

Back, nape, and underparts as in *C. apus*, the white on the throat more extended. Crown, rump, tail, and wings light brown with a slight coppery-pink gloss. Primary coverts, shafts of quills, and outer webs of wing-primaries blackish. Forehead very pale, with a whitish upper edge to the black patch in front of the eye.

J. Length 7 inches; wing 7; tail 3, depth of fork 1; wing reaching beyond tail 1.2. Legs deep purplish brown, with black claws. Inside of mouth flcsh-colour, with a purplish tinge, especially in lower jaw. Skin round eye and bill blackish brown tinged with purple. Iris bright brownish black. Judging by the bareness of the breast and belly, both male and female sit on the nest.

[June 9,

On the 9th of August I went out again to the neighbourhood of the Black-Dragon temple, and the following day started with some friends for the Meaofungshan, a temple built like a fortress on a hill 1500 feet high. The road lay across the valley and over the range (1300 feet) on which the Tacheo-sze temple stands, along a plateau and through an orchard-planted ravine. On the grassy parts of the hills Emberiza cioïdes, Brandt, occurred frequently, singing sweetly a Robin-like song; but about the orchards and plantations of oak there were few birds. The ear was everywhere deafened by the noisy Cicadas. In the ravine about the foot of the Meaofung hill the chief species was a brown Cicada about $1\frac{1}{2}$ inch long, known to Europeans in Peking as "Keenlung's Nightingale." Its cry may be syllabled "Meao-meao-meao-may ----." It is said by the Chinese to have been introduced from Jehol into this neighbourhood by the Emperor Keenlung, who took great pleasure in its note. The noise it makes is perfectly bewildering, and one cannot but feel pity for the Emperor's unaccountable taste. From the small village at the foot of the hill it was a painfully fatiguing climb up the winding stone steps to the temple. This temple is considered especially sacred in the eyes of the Pekinese, and twice each year is visited by pilgrims, who make the journey, a distance of thirty-five miles from Peking, on foot, prostrating themselves at each step. There were several kinds of birds about the woods on this hill. Kestrels and Erythropus amurensis, Midd., were about in numbers; and in the pine-trees about the temple I watched with pleasure the movements of the little Sitta villosa, Verreaux, and the Crossbill. The early morning of the following day was cold, and a high wind was blowing. Choughs and Kestrels were rising and falling in the air at one another against the wind. In the wood below, the Erythropus was feeding its fledged young on the branch of a tree. On the rocks below the temple two Squirrels were active, chasing one another and fighting. I secured one; it was brown, with a long brown bushy tail and whitish underparts; its ears were rounded, and not plumed; and its face was more sharp and Rat-like than in ordinary Tree-squirrels. It resembles in colour the Sciurus chinensis, J. E. Gray, from Ningpo; but the latter is a smaller animal, with rounder head, and more arboreal in habits. The Peking Museum had several specimens of the northern species; and M. A. Milne-Edwards has lately figured it, in his 'Recherches des Mammifères' (in course of publication), as the Sciurus davidianus. We returned by a long circuitous route, which took us eastward through a long gully to a cul-de-sac among the hills, to get out of which we had to ascend the Shipa-parh, or "eighteen flights" of stone steps. The descent took us to the banks of the Wenho (river). Our course thence lay north-westwards through the valley to the Black-Dragon temple. It was a long, fatiguing walk of twenty-eight miles. On our way among the bushes on the hills we heard the Garrulax-like note of Pterorhinus davidi, milii, and saw small parties of Rhopophilus pekinensis (milii) flitting along the tops of bushes singing sweetly.

On the 13th of August we paid another visit to Tacheo-sze (the

Prussian temple), but beyond Crossbills and Goldenwings we saw nothing of interest. The Crossbills were usually on the tops of the pine-trees feeding on the cone-seeds, and twittering in notes much like those of a Sparrow.

LOXIA ALBIVENTRIS, Sp. nov.

Small; like in colour to *L. curvirostra*, *L.*, but differing from all the known species in having the abdomen and under tail-coverts white, the latter with large central arrow-head brown spots. Under quills whitish.

Length 6 inches; wing $3\frac{5}{8}$; tail 2; tip of wing to end of tail $\cdot 6$. Iris brown; bill brown, light horn-colour along the tomia. Legs, toes, and claws blackish brown, washed with pink on the soles. Called here *Keao-tsuy* (twisted bill).

On the 14th of August, with two donkeys to carry our baggage, we walked northwards across the millet-plain twenty miles to Changpingchow, and put up at an inn near the west gate. This town contains a Taotai, who has charge of the tombs of the Ming Emperors, situated in a neighbouring valley, and called the Shih-sán-ling (or thirteen eminences). In the early morning we got donkeys, and rode to the celebrated tombs. Two miles of road brings you to the commencement of the sacred precincts, marked by a high open gateway of three arches, whence leads a paved way for a mile to a brick gateway, also of three arches; a mile further and you reach a single bronzed arch with a large tablet inside, raised by the Emperor Keenlung of the present dynasty, who repaired the tombs; then a series of animals in stone flank the way on either side, one kneeling and one standing, of the following in order-the fabulous Kelin, Lion, Camel, Elephant, Tsowshow (Lion with scales and hoofs), and Horse, succeeded by two warriors and two statesmen. Three triple arches are next passed, and you have a cultivated plain before you bounded by hills, at the feet of which you can count, as you gaze round, thirteen enclosures of various extent, with what looks like a painted temple with yellow tiling in each, surrounded by trees. A stream crosses the plain; and the ruins of a marble bridge show the course of the road from the arches. The tomb of the Emperor Yunglo was the largest and best wooded; so we bent our steps along the broken stone causeway to that. The porter in charge was called and let us We were led into the hall where the shrine was placed,—an in. enormous room 70 paces long by 33 broad, and about $\hat{60}$ feet high in the centre, the sides a little lower; the ceiling was chequered and painted, a good deal like that of the Elgin Gallery in the British Museum, and supported by huge pillars of single timber, each 12 feet in circumference, throughout its great length. There were eight of these pillars. In rear of this large hall is the great mound in which Majesty's bones are entombed. After all this the Society will expect to hear something of the ornithology of the place; but birds were scarce. Tits (Purus minor, Temm. et Schleg.) and P. kamtschaticus were commonest; but I looked in vain for the Crested Cole-tit (P.

pekinensis, David). Sitta villosa, Verr., occurred (itself almost a Tit in habits) running along the slender twigs of the trees and hanging about the leaves, fighting and pursuing one another, and at times giving utterance to a lively chatter a good deal like that of Lanius lucionensis, Strickl. I was enabled to get several specimens. The males differ from the females in having a black cap. It has a very close ally in Sitta canadensis, L., of North America. A pair of Ruticilla aurorea (Pall.) had hatched a brood of young in the grounds, and were feeding their spotted fledglings on the stone parapet. The sun was setting, and we were leaving the place annoyed at our bad luck, when an Owl popped out of its roost in the bosom of a tree. I winged it; and after a hunt we secured a fine specimen of a Wood-owl, which seems to be the Himalayan race Syrnium nivicolum, Hodgs. \bigcirc 2. Length 16.5 inches; tail 7.25; wing 11.75; wing-tip to end of tail 1.75. Irides black. Skin round eye yellowish flesh-colour. Bill wax-yellow with tinge of green. Soles of feet yellow; exposed part of toes greenish yellow, as also are the bases of the claws, rest of claws blackish brown.

The distance from Changpingchow to the tombs is about nine miles. On the 19th I crossed the hills and paid another visit to H.M. Minister at Lingshansze temple. Several temples stand on higher positions up the hill-side, and many of them were occupied-one by the American legation, another by the Chaplain to the British legation, and others by the secretaries and students also of our legation. These were all attainable by stone steps winding through the ravines and over the hill-sides. The ravines were well planted with trees, of which the chestnut-leafed oak was most in abundance; its acorns support the Pigs, and the acorn-cups yield a black dye. The Kælreuteria flata, Bunge, with its popping pods, was also plentiful, and the Sophora japonica or locust-tree. This last is the commonest tree in the city of Peking, and is sadly infested with a green Measureworm, which developes into a brownish-mottled moth. The tree bursts into leaf in spring, and in a few weeks stands denuded, every leaf having been eaten by this caterpillar. It shoots again into leaf, and is again stripped. Three efforts are made by the tree in the year, and three times it is robbed of its leaf; and yet the tree is abundant and does not perish. In Boston, U.S., a similar worm is said to make great havoc among the locust-trees of that city; and to put a stop to it the citizens imported the Sparrow (Passer domesticus, L.); but Passer montanus, L., abounds in Peking; yet the Measure-worm multiplies in spite of it. A scented Artemisia spreads everywhere on these hills, scattering a dust-like yellow pollen. A sprig of this is placed in the headgear between the ears of Mules and Donkeys to keep off the blood-sucking flies that swarm on the backs of the ears of the poor beasts. The plant is twisted by the country people into ropes, which are burned to ward off mosquitoes. In this neighbourhood the commonest *Cicada* that deafens you is the green one of the south, about an inch and a quarter long. It keeps on crying "Kwai-kwai," &c., for some time, and then finishes with a prolonged "sze." A second is a large dark-brown species called

"Knife-grinder," also of the south, which sustains one note throughout, sounding like the grinding of a knife on a wheel. A third is smaller, also dark-coloured, with yellow lines on its face, and utters a single bell-like sound, heard often at night as well as in the day. All these three visit the city.

It may be that the presence of so many Europeans with guns had driven the birds away; but in the hill-side woods insects seemed to hold complete sway. In the early morning there were some signs of feathered life, and a few songs were to be heard; in the noonday no life stirred, you felt choked with heat and deafened with Cicadas; but the evening came on fast, the Hawk and Crow tribes were active, Chukar Partridges might be heard chuckling in the grassy hills above; and as darkness stole on the Goatsucker would start into life, with its continued "chuck-chuck" note, and commence pirouetting over the trees. I shot one of them on the 31st of August : it was moulting its quills ; but I found it to be Caprimulaus jotaka, T. et S., as I had suspected. Its remarkable note, uttered at nightfall and the night through, attracts the notice of every visitor to the hills, and they generally attribute it to an Owl. The Chinese give no help in explaining what the bird is, as they call it the Teayshoo-pe, or "Bark of the Iron-tree," from its bark-like appearance, I presume, when it lies along a branch at roost during the day. By the end of the first week of September the Goatsuckers had all disappeared.

On the 1st of September we went out to look after Partridges. We kept along the plains, and did not see a bird. A Quail or two was all we saw in the game line. The trees were full of *Phyllopneuste* sylvicultrix, mihi, and *P. plumbeitarsus*, mihi; and some *Reguloides* superciliosus (Gmel.) were about. A species of Scorpion was common under stones, attaining a length of 2 inches. It frequently finds its way into honses; and its sting is poisonous. I was told on good authority that if surrounded by a fire this Scorpion turns its tail up and stings itself in the head, causing death. I was not inquiring enough to try the experiment.

I will here insert the few notes I made on specimens procured in the hills.

Tchitrea incei, Gould, \mathcal{S} . Length 9.25; wing 3.6; tail 5.4, central feathers .6 longer than the others; wing-tip from end of tail 1.1. Bill, legs, and eyelid fine cobalt blue. Inside of mouth greenish yellow. Testis very large. Skull large, with difficulty drawn through the neck. This bird was shot at the end of May, and, from the state of its nasal organs, was prepared to breed; and yet the long feathers of its tail were not developed as in autumn. On the 7th of September I got a full-plumaged bird of the year. It had the brown bill and feet and light plumage analogous to Tchitrea principalis in the same stage. The cry of the adult bird is lond and chattering, similar to many of the notes of Cyanopica cyana (Pall.).

Caccabis chukar, Gray, \mathcal{J} . Length 12.25 inches; wing 5.75; tail 3.3, of 12 graduated feathers rounding into a semicircle when ex-

panded; tip of wing to end of tail 3.1. Bill and skin rouud eye pink or coral-red; iris red sienna; legs lighter pink red, with pale soles and brown claws. This bird was shot on the 5th September. A party of them were feeding in a millet-field at the foot of the hills. They, on alarm, at once took to the hills, dispersing among the rocks, and calling to one another. Their note is a chuckle, "kok-kok-kok," the syllable constantly repeated. When pursued they at once run up the hills; and if the hunter wants sport, he must get above his birds, when they can be made to take wing. It is a great scramble to catch a wounded bird. The Pekincse call them *shih-ke-tsze*, or "Rock-fowl."

Picus poliopsis, Swinh., Q. Iris bright chestnut-red. Bill blackish brown, asparagus-green at base, with which colour the whole of the bill is washed. Legs greenish brown, ashy yellow on soles; claws brown, with pale bases. This species appears to be rare about Peking. I only saw one other specimen of it during my stay. It is a second species of the subgenus *Hyopicus*, of which *P. hyperythrus* is the type. It differs from its Indian ally in having its underparts yellowish brown instead of chestnut, the cheeks and sides of neck being snuff-coloured. The crimson of its rump mounts to the belly. It is rather larger in size, and is more banded with white on the back and scapulars. The white spots on the head of the female are much larger. I considered it a variety before; I think now, on seeing a third example, that it is well entitled to specific rank.

Hemichelidon sibirica (Gmel.), bird of the year. Breast and flanks confusedly streaked and spotted with deep greyish-brown. Upperparts spotted with pale ochreous, lesser wing-coverts tipped with the same. Two adult specimens from Siberia of this species, kindly sent me by Dr. v. Schrenck of St. Petersburg, are paler than Chinese examples, but otherwise similar.

I will take the opportunity of here introducing two species from North China in my collection, which appear to be new.

ARUNDINAX FLEMINGI, sp. n.

The small species of reed-bird that Mr. Fleming, R.A., brought from Tientsin in 1861 seemed to answer to the description of *Salicaria cantillans* of the 'Fauna Japonica;' and I included it in my China list under that name. I have now the Japanese species before me, and find the two birds quite distinct. The wing of our bird shows a different proportion of quills; the tarsi and hind toe are much shorter, and the hind claw and toes much weaker. It is smaller in every way, and differs in its coloration.

Upper parts light brownish olive, eyebrow and cheeks pale ochreous, lore creamy white, with an obscure brown streak between it and the eyebrow; throat and middle of belly white. Underparts primrose-yellow, tinged with buff, strongly on the vent. Quills and tail light hair-brown, margined with light brownish olive. Bill brown on the upper mandible, except its tomia, which, with the lower mandible, are ochreous yellow. Irides blackish brown. Legs and toes ochreous flesh-colour. Length about 4.5 inches; beak in front .35, from rictus .52, depth at base .13, breadth at base .15; tarse .83; middle toe .55, its claw .18; hind toe .35, its claw .22; wing 2.35, fourth and fifth quills equal, sixth a trifle shorter, first 1.1 shorter, second .35, third .6; tail 2.1, of twelve feathers, the penultimate .5 shorter than the eight centrals, which are equal, outer rectrix in the specimen not full-grown.

I have also an *Emberiza* that Mr. Fleming brought from Tientsin, which I registered before as *E. stracheyi*, Moore, but wrongly. I have since procured a specimen from the country near Amoy, shot in December 1867, which has rather a larger bill; and I have a bird from Père David, taken at Peking on the 12th May 1867, with a shorter and rather smaller bill. They are all three males. The Tientsin and Peking birds are in summer plumage, and have the whole head and throat black, with a broad line of white down the centre of the crown, a broad white eyebrow, and a broad white moustache; on the under neck, below the black throat, a large white spot occurs; and again below this comes the rufous pectoral band. The Amoy bird was shot in winter, but still shows much black on the throat. I suggest for the species the name

EMBERIZA TRISTRAMI, Sp. nov.

Crown black, dividing at the occiput, and running in a broad line down each side of nape; at the division on the occiput a large white spot occurs; and a little olive tips the central crown-feathers, suggesting a central streak, in immature plumage. Eyebrow and long moustache-streak white, with a splash of yellowish olive, which Lores, under the eye, and ear-coverts marks also the lores. brownish olive, a black line running from the hind corner of the eve round the car-coverts. Throat yellowish brown, more or less marked with black. Upper parts light yellowish brown, with an olive tinge; the black nape-lines change into deep rust-colour and continue to the centre of the back; scapulars and lower back with broad centres to feathers black, flanked with rust-colour. Rump and upper tailcoverts bright rust-colour; the two central rectrices brownish ferruginous; the fifth and fourth brown, rust-coloured on the outer web with light yellowish-brown edging; the third of somewhat lighter brown, with a small white spot on the inner web near the tip, which is also white; the second, with half the inner web white, running from half an inch from the base along the shaft to the tip; first or outermost feather white, except a brown mark along the outer web encroaching on the inner towards the tip; all the unmentioned parts of the last rectrices are brown. Wing-coverts blackish brown, the lesser broadly margined with light olive-brown, light ochreous at their tips; the greater edged broadly with brownish ochre, those covering the tertiaries being rust-colour, with black median mark; winglet deep brown, with rusty edges ; primaries hair-brown, the first quill edged with white, the next few with pale yellowish brown, gradually assuming a rust-colour towards the innermost

quills; tertiaries blackish brown, broadly margined with rust-colour, which increases inwards until it predominates over the brown.

Underparts.—A white spot succeeds the dark throat. Breast and flanks rusty buff, with darker median streaks of the same on the former, and blackish streaks on the latter. Belly, vent, and axillaries pure white.

Bill somewhat finch-like, brown on upper mandible and on apical third of lower; basal portion of latter flesh-colour.

Legs, feet, and claws yellowish flesh-colour; the last curved and sharp.

Length about 5.5; wing 2.9, the four first quills nearly equal in length; tail 2.85, composed of twelve rectrices narrowing towards their tips; bill in front .4, depth at base .23; tarse .7, hind toe .3, its claw .27.

The description is taken from the male procured near Amoy.

We left Peking on the 17th September by the Tihshing gate, and, passing the towns of Tsingho and Shaho, put up for the night at Changping Chow, twenty-five miles from town. Before reaching our resting-place, we strolled under some willows, saw two Orioles (Oriolus chinensis), and secured a female Turdus pallidus, Gmel.

On Sept. 18th sent our carts on to Shihshanling (Ming tombs), and walked along the hills at the back of Changping Chow, that overlook the valley of sepulchres. Saw a flock of Chukar Partridges jumping up the rocks, and put up two Bush-quails, Turnix maculosa, Temm., in the valley among the beans. Wheat was being sown, sorghum and other millet being gathered ; buck-wheat was in the ear; and the small beans planted between the rows of sorghum were ripening. Large numbers of Kestrels were flying and hovering about. Their movements struck me as peculiar; and on shooting a male we found the species to be a race of Falco cenchris, Naumann. We procured on this occasion an adult male, and in the Western Hills a young male. They agree in size and form with F. cenchris of Europe; but the adult male has all the wing-coverts grey right up to the scapulars, most of them narrowly edged with rufous. The adult has the inner or short primaries broadly bordered at their tips with whitish, rufous in the immature, and wanting in the European bird. Both adult and immature have the white on the under quills $3\frac{1}{4}$ inches short of their tips; in the European bird it advances one inch nearer the tips. I will note this Eastern race as var. peki-It will probably be the bird that winters in India. nensis.

Among the trees of Yunglo's tomb I was attracted by a loud shaking cry I had never heard before; and while wondering what it could be, I saw a bird like an attenuated Jackdaw fly across and fix on the trunk of a tree. *Picus martius*, of course! My heart throbbed violently; but it was no easy matter to bring him down, the shot had such little effect on him. One of my comrades helped me in the pursuit; and we at last secured the noble fellow: iris reddish white. I loitered about till dusk; and when nearly dark, something flapped violently across the avenue. Crossing under the trees, I could just distinguish the outline of a large smoothheaded owl on a bare branch against the sky. I bowled him over, and found him to be a Syrnium nivicolum, Hodgs., again—the species I had got here on my former visit. The other birds procured were a Green Woodpecker (*Picus canus*), a Pied Woodpecker (*Picus mandarinus*), a Titlark (*Anthus agilis*), which was common about the trees, and a couple of Nuthatches (*Sitta villosa*, Verr.).

The night of the 19th we passed in a one-roomed cottage, dignified by the name of inn, near Yunglo's tomb. It was like the stall of the old cobbler, "which served him for kitchen, for parlour, for all." I will say nothing of the horrors of the night, or of our personal appearance in the morning. What I lamented was the blackened state of my specimens from the constant fumigation they were subjected to. On rising we were saluted by the notes of a Picus scintilliceps, milii, from a neighbouring tree. We had heard talk of a forest existing over the mountains, and we got a guide to lead us to it. Unfortunately the term for forest in Chinese means any thing from a clump of trees to a large expanse of wood; so that after clambering about the rocks and wading to our necks in damp grass for some hours, our guide brought us to a standstill at a group of firs, and told us that was the largest forest on these hills. We retraced our steps in disgust, but not till we had renewed our acquaintance with Rhopophilus pekinensis (mihi). It was whisking about its long tail on the tops of bushes, uttering a loud whistle. Its eyelid was madder-red, its iris washed with yellow; upper mandible light brown, lower vellowish white; legs brownish flesh-colour tinged with yellow.

From the Ming tombs to the town of Nankow, at the gate of the mountain-pass which leads through the inner portion of the Great Wall, there was a good road for the first six miles; the remaining six were fearfully stony and rocky, and the jolting of the cart endangered one's bones. A gentleman from California put up at our inn, and we spent an instructive evening together.

From Nankow, the gate that opens into the pass, to Shato, beyond the gate at the top of the pass, is fifteen miles; but the road is blocked with stones and lumps of rock, and our carts had to be unpacked and helped through with extra animals and men, while our goods were transported on donkeys. My two companions and I walked and rode on horseback. A male Sparrow-hawk (Accipiter nisus), with clear yellow irides and long yellow toes, was all we bagged; but we were delighted by witnessing the stoop of an Eagle. He was flying slowly across at a height over the deep gully through which we were travelling, when suddenly, like a stone, down he came and, shooting obliquely, struck a bank within fifty yards of us behind a cottage. He seized a Leveret ; but the little creature slipped away from him, and escaped to the ditch below. We were so struck by the sight that we did not think of seizing our guns till the bird was out of reach. The wild rocky hills of the gorge draw closer as we approach the upper wall, that crosses the pass. Another flock

of Partridges attracted my comrades; and I sat down to gaze upon the treeless scene. Something moved to the right, and in an instant a little Squirrel stood on a rock before me, stroking its whiskers with its paws, and glancing at me. In another second, and it was scampering to another rock. I saw several of them, and found it common enough on our return through this pass. It is a groundspecies, and seems identical with Tamias striatus (Pall.), which occurs also in Amoorland. The Great Wall at the upper gate of the pass is about 25 feet high by 16 broad, with turrets along it at a distance of every 120 yards; it stretches away along the ridges of the hills, to the right and left, out of sight. The wall of the enclosure at the gate was in ruins and deserted, and the pavement under the gate broken up. Two miles more of broken road brought us to the almost deserted walled town of Shato, consisting chiefly of bad inns. We went through it, and put up at an inn of a better class in the suburbs beyond. The country about was desolatelooking, composed of sand and gravel, in which some travellers have found marine shell. Growing out of the side of a cliff was a bushy tree, in which a pair of Choughs had made their roost. They were too shy for us; but later on our march we got several specimens, and found the species to be the European Fregilus graculus, L. (iris liver brown), called by the Pekinese Hung-tsuy Yatsze (Red-billed Crow).

In the afternoon of the 21st we reached Hwailai Hien, the hills having receded, and the country become more open and better cultivated. A small river runs to the south past this city, and is spanned by what was once a fine bridge of seven arches, leading to a gate in the city-wall. We dismounted, and walked along the river. We saw a Heron (Ardea cinerea), some Snipe, Golden Plover, and a large flock of Rooks (Corvus pastinator, Gould). Passing a mud-walled city, we continued, along a bad, stony road, to Shaching (or the Three Cities), where the inns were many and excellent. On the way we passed dilapidated towns and the ruins of limekilns, among which pigeons were breeding in very large numbers in a feral state. We shot several, and found that the reversion was not to the plumage of the Rock-pigeon of the country, Columba rupestris (Bp.) with a white bar to its tail, or to the ashy-rumped bird of India, C. intermedia, Strickland, but to the pure "Rock" of Europe, C. livia (L.). It must be from Europe, then, that the Chinese derived their breed of Pigeons. Iris light yellowish-chestnut. From our last roost to Shaching was reckoned seventeen miles.

On leaving Shaching (22nd September) we made for the N.W. corner of the hills on our right; to the left was a cultivated plain, with the Wenho (river) winding southwards through it, and barrenlooking hills beyond. To the north of the walled town of Keming Yih a hill rises about 2000 feet, with a temple on its top. These hills are very bare of vegetation, covered with broken rock, and yield coal. Notwithstanding their sterility, the Chukar Partridge found them a pleasant retreat, and we were constantly breaking from the line of march to follow the chuckling that burst close above us. Flocks of

1870.] MR. R. SWINHOE ON CHINESE ZOOLOGY.

Swallows, H. gutturalis and H. daurica, were constantly seen; but passing the Keming Hill another species appeared on the scene. I detected it at once to be the Cotyle rupestris (Scop.). Its larger size, greater breadth of wing, and broader rump distinguished it, while flying, from the C. riparia. It occurred in small parties, perching and playing about the rocks. We saw them several times during this expedition. Iris liver-brown; wing extending half an inch beyond tail. Along the base of this hill-range the road reaches a gorge made by the hills on the left advancing, with the river racing through between over rocks and shallows. Emerging from the gorge, a large hilly patch of sand occurred, sparsely sprinkled with coarse grass. It was riddled with holes; and little rat-like creatures were standing on hind legs, or popping their heads out of the holes, or gambolling after one another, just as I have since seen the prairie-dogs do on my railway transit across the continent of America. A shot fired among them, and all disappear like magic. They move fast, but awkwardly, somewhat like Guinea-pigs. Their burrows twist and turn in the descent, so that one cannot reach down with a stick. One came skeltering along, squeaking, with another in pursuit, on to a grass patch. I secured it. Its irides were brown. It appears to be the animal that M. Milne-Edwards has figured in his outcoming 'Recherches des Mammifères' as Spermolegus mongolicus, and that from Amoorland, figured in Middendorff's 'Sibirische Reise' as Arctomys (Sperm.) eversmanni (Brandt). My specimen is light brown above, cream-colour below and along the sides. The tail is short, the first half inch of its length with short reddish hair, the rest with lengthened hair expanding into a spatula-shape, rufescent at its roots, a broad black ring on its centre, with broad creamy tips. Both Middendorff and Milne-Edwards in their figures convey a good idea of its appearance. A young specimen that I have from Peking has the upper parts much darker and ruddier, and the underparts buff-coloured; tail rufous, with short hair throughout. M. Gill, the amateur naturalist attached to the French camp, procured this animal in 1860 near Peking.

Over some tough stony hills we reach Heangshuypoo, twentythree miles from our morning's start; and as there was still daylight, we pushed on over worn roads until, benighted, we were obliged to put up in a filthy cattle-stall at the dirty village of Neho-tsze, six miles further on. Dozens of carters and country roughs cooked, ate, smoked, and talked all night in our cabin, while a storm made the darkness horrible outside. We managed to pig it somehow, and survived the night.

Next morning (September 23) we trailed through the mud for the remaining five miles, and put up in an inn in the suburb outside the wall of Seuenhwafoo, the capital of this prefecture. It rained all day, and was cold and wretched. At this city the Roman Catholics have a prosperous mission, with European priests resident; and it was here that Père David got a great many of his good things. The streets were under water; so we had much difficulty in wading through the town. In one of its thoroughfares some live birds were offered

PROC. ZOOL. Soc.-1870, No. XXX.

for sale; the best were Garrulus brandti, Eophona personata, Leucodiopterum sinense, and Acridotheres philippensis (the last two from the south).

We travelled, on the 24th of September, the remaining twenty miles and reached Kalgan, or Changchiakow. Near this town the road again became stony, and the hills closed round to form the long pass which gradually ascends for thirty miles, until it places you on the boundless grassy plain of Mongolia. We passed many parties of Mongols with strings of camels, and driving troops of ponies, and several of their encampments. Crossing the Tungkeao (bridge) which spans the stream that runs down from the pass, we put up at a Mahommedan inn outside the city-wall.

On the 25th our Mahommedan host took us for a walk to show us the lions. Lower Kalgan, or Hiapoo, is the walled city of Wantseuen Hien. The road leads past this town to Upper Kalgan, or Shangpoo, about three quarters of a mile distant, at the end of which, in a short gorge, is the gate of the famous or old Great Wall. Up the hill on either side runs the wall, or rather its ruined remains—in many places little more than a line of rubble; but up the mountain and down into the valley, as far as the sight can strain, it holds its serpentine course. The wall of the Nankow Pass supplements this, enclosing the prefecture of Senenhwafoo, which belongs to the Chili province, but is still often called Mongolia. Our host told the guard of the gate who we were, and took us outside of China. Beyond the gate the pass was divided into two by a lower hill-range, with roads on each side which united further upwards. The roads were broken and rough in places, made of slabs of stone which had got displaced; and the hills were barren and had a scorched look like those of Aden. We were not tempted to continue our journey in jolting carts, and preferred spending our few extra days of leave in returning leisnrely by the way we had come. Rooks, Magpies, and Kites were common about Kalgan, and Reguloides superciliosus and the Pied Woodpecker were the most frequent birds in the trees about the gardens in her suburbs. One of the latter I fired at died clinging to the top bough of a tree, and there was no getting it down.

We spent the morning of the 27th of September strolling about the neighbourhood of Keming. In the fields towards the river Rooks and Jackdaws were feeding; all the Rooks appeared to have feathered chins. Among the willows we found the Barbary Dove (*Turtur risorius*, L.). We frequently came across this species in this prefecture of Senenhwafoo between the two walls, as also *Turtur* gelastes (Temm.). In the neighbourhood of Peking the latter occurred, but not the former; and, indeed, I have never seen the Barbary Dove in any other part of China. It is a tame, gentle bird, and easily approached. I procured both full-plumaged young without the neck-ring and adult birds. Its eyelid is pale yellow, iris chestnutred; bill brownish black; legs madder-pink, with black claws. *Turtur gelastes* has the eyelid deep madder-pink, iris golden-sienna; bill brownish madder, browner on apical half; legs purplish madder, with black claws. Some little birds among the willows were uttering 1870.7

a plaintive "teo" note. I shot one, and found it to be the Reguloides proregulus (Pall.). I also shot a Phylloscopus fuscutus (Blyth) creeping tamely about the grass. Pied Woodpeckers were common ; and we got several. Snow lay on the distant peaks to the north-west. We made for the temple-crowned mountain. As we approached the road under it a flock of Chukars (Caccabis chukar) flew up from the corner of the stubble and took to the hill. We pursued, and had some good sport. The Chinese rightly enough name this the Shihke-tsze, or "Rock-fowl." Well up the hill-side a party of red-tailed birds were disporting, flying from rock to rock with loud notes. One was shot, and turned out to be a new form of Accentor, allied to A. alpinus, L. I exhibited it to this Society on the 24th of February, 1870, and proposed to name it Accentor erythropygius*. We saw a few of them later in the Nankow Pass. On this hill we came upon another interesting bird; it was a Sparrow-like species of Carpodacus, of a sandy-grey colour tinted with rose. There were two together, of similar colour and form. We secured the male: iris black ; bill light brownish horn-colour ; legs liver-brown, ochreous on soles, with deep-brown claws.

The museum at Paris has received specimens of this species from Père David; but it has been there confounded with the *C. obsoletus* (Licht.), a species with a largish black bill (*ef.* Nouv. Arch. du Muséum, t. iii. p. 31). I find its nearest ally to be the *C. githagineus* (Licht.) of N.E. Africa, from which, however, it can at once be distinguished by its smaller bill. I will name it

CARPODACUS MONGOLICUS, Sp. nov.

Male. Upper parts sandy grey, browner on the crown and back; feathers of the crown, back, and scapulars with brown centres; wingfeathers blackish brown, greater coverts broadly margined with rosecolour, the primary quills more narrowly, and tipped with creamy white, the brown of each feather paling near the white; secondaries broadly margined with cream and tipped similar to the primaries; tail deep brown, whitish on edges of inner webs and broadly edged on outer with cream-colour; sides of neck, throat, breast, and flanks light sandy brown; rest of underparts cream-white. Rose tinges the sides of the head, forehead, throat, cheeks, breast, flanks, and rump, brightest on the last.

Length about 5.3 inches; wing 3.63; first quill .05, the longest; tail 2.3, forked; centrals .3, shorter than outermost; upper tailcoverts extend to .65 from the tip of the tail; bill .34 in length, .2 in breadth, .29 in depth; tarse .66; middle toe .52, its claw .24; hind toe 28, its claw .26.

Near Shato, on the 28th, a small Owl showed itself on the top of a ruined brick-kiln, with wings expanded, basking in the sun. It was easily bagged. On our way out I had also seen one exposing itself on a ruin during the day. It turns out to be a new form of *Athene*, most nearly allied to *A. glaux* (Sav.) of S. Europe, in its pale colour, but differs from that as well as from *A. noctua* (L.) of N. Europe, and

* See anteà, p. 124, Pl. IX.

A. bactriana (Blyth) of Thibet, by its short tarse covered with long down, and by its well-clothed toes. I propose to distinguish it as the

ATHENE PLUMIPES, Sp. nov.

Throat white, the white extending in crescent-form up each cheek in rear of ear-coverts (the lower white neck-ring of *A. noctua* is wanting); lores, round eye, and middle of belly also pure white; upper parts light reddish brown, with drops of reddish white on the head, and marked and spotted much as in *A. noctua*; underparts, leg-, and feet-feathers cream-colour, on the breast and flanks broadly streaked with reddish brown, like *A. glaux* (*A. noctua* being spotted with white on a dark ground and wanting the white on the centre of the belly); bill yellow tinged with green; irides light yellow; claws blackish brown.

Length about 8.5 inches; wing 6.2, of similar-proportioned quills to those of A. noctua; tail 3.6, of twelve equal feathers; tarse to base of hind toe .85, densely clothed with down-like feathers, .65 long; feet covered with shorter hair-like feathers, just showing scales at end of toes; soles bare and yellow.

Towards evening, as we drew near to Shato, very large flights of *Erythropus amurensis* (Radd.) and *Falco cenchris* (Naun.) appeared in the skies overhead, flying high to and fro and round like Swallows about the temples in the western hills; they were also to be seen at this season in large numbers preparatory to their migration. They must, however, wind away south-westwards, as they_do not appear on the southern coast of China.

In the Nankow Pass we saw Eagles again, a small number of Urocissa sinensis (L.), and a single Eophona personata (T. & S.). One of my comrades shot the last, and had a piece of his finger nearly bitten out by the formidable mandibles of the bird. I noticed that the Crows here pursue and torment the Eagles just as fearlessly as they do the Kites in Southern China.

On the 30th of September we reached Peking just before the shutting of the gates.

In the last visit I paid to the museum I found a native with a live Nutcracker for sale. I engaged this man to collect for me, and through him got some very good things. He had worked for Père David. It was a pity that I had not got hold of him before, as now my time was getting short. He brought me three Nutcrackers, all females, of the European Nucifraga caryocatactes (Pall.), called by the Chinese the Tsung hwa'rh, or "Onion-flower." Irides dark, liver-brown, the same colour as the crown of their heads; bill, legs, and claws blackish brown.

Hawfinch, Coccothraustes vulgaris, \mathcal{Q} : iris light yellowish brown tinged with grey. Zosterops erythopleura, mihi: the female has less red on the flank than the male; bill light bluish grey, marked with black on upper mandible; legs deeper bluish grey.

Accipitor palumbarius, \mathcal{J} . Bill brownish black, bluish grey at base; cere king's yellow marked with blackish brown, rictus king's yellow; inside of mouth light purplish blue marked with black; eyelids

1870.]

black, iris fine clcar yellow; legs and toes clear yellow, with black claws.

Left Peking on the 7th of October, and reached Chefoo by steamer on the 12th, where I spent a day or two. While out for a walk, put up a Chefoo Hare. This Hare is sent by the European resi-dents at Chefoo to their friends in the south, and is a great treat when compared with the small species Lepus sinensis (Gray), which is the ordinary Chinese animal. It is, when cooked, as fully flavoured as the English Hare, and in general appearance greatly resembles it, but is smaller and varies in the colour of its fur from the brightness of Lepus timidus (L.) to a ruddy cream-colour. I have several specimens of its skin and skull, and I cannot distinguish it from Lepus tolai, Pall. Père David procured it in the neighbourhood of Peking, where I found the smaller and harsherhaired L. sinensis the prevailing species; and he also reports it common in Mongolia. My brightest specimen (\mathcal{Q}) has the head pale rufous-brown, deeper on the forehead and crown, and somewhat yellower on the outer surface of the ears, all mottled with black, the black appearing in an irregular streak or two on the cheeks; the upper lips, chin, throat, and circle round the eye produced backwards in the form of a half eye-brow, are creamy white; moustache-bristles white, some of them brown near their bases; inner surface of ear rufous cream-colour; back of ear pale fawn-colour, with a broad brownish-black tip; on the hind neck behind the ears an unmottled light rufous patch occurs; back yellowish rufous, with most of the hairs broadly tipped with black; these hairs are dark brown towards their bases, with thick brownish-white down; rump and sides of thighs unmottled creamy rufous; tail black on upper surface; beneath white, as are all the underparts to the fore legs. Under neck, chest, sides of body and legs yellowish rufous, the fore legs with a creamy patch above the paws, and the inner surface of hind legs and feet creamy white. Long hairs are scattered over the upper parts.

	in.
Length from muzzle to root of tail	19
of tail (including '75 of tip-hair)	3
of head	4
——————————————————————————————————————	3.80
	6.75
of hind leg from hip	9
of skull	3.54
Width of skull (arch to arch)	1.63
between orbits	1.1
Length of nasal bones	1.53
Width of ditto behind	$\cdot 81$
of ditto in front	•53
Length of incisive opening	·88
Width of ditto behind	•43
Length of the six upper molar teeth together	•65

A second specimen (\mathcal{J}) is lighter and more cream-coloured, with

[Jnne 9,

the light-rufous hairs of the upper parts the same colour throughout, and only occasionally tipped with black. The ear at the back has only an apical margin of black; and the animal answers to Waterhouse's description of L. tolai (Mammalia, vol. ii. p. 48).

A third (\mathcal{Q}) is paler, duller, and more dingy throughout than the last, with very little rufous, and its back is more mottled with black; but its apical ear-patch is as conspicuous as in the first. All three are from the same locality, and it cannot be doubted are of the same species; yet they vary so much in coloration. Their skulls, more-over, are of nearly similar form.

I have only fallen across two other mammals (not to speak of Bats) in North China not alluded to in this paper; and these are a Hedgehog and a Mole, which I procured when with the troops at Peking in 1860. I sent a specimen of each to this Society, and they were presented to the British Museum. Dr. Gray pointed out that the Mole was a new species. but did not assign it a name (P. Z. S. 1861, p. 390). Some years after, the Abbé David sent the Mole to Paris, and M. A. Milne-Edwards has described it as *Scaptochirus moschatus*. The Hedgehog Dr. Gray considered to be *Erinaceus* collaris (Gray) of South Iudia; but it seems to me to be distinct from any thing yet described.

Erinaceus dealbatus, sp. n. from Peking. About the size of E. europæus, its nearest ally; much paler; spines shorter and thinner, and all setting backwards, pale brown, whitish at bases and tips; ears shorter, narrower, and more hidden; hair of underparts shorter, of a whitey-brown colour, with rufescent down at roots; face whitey brown, with brown ears (no black on the muzzle and round eyes as in E. europæus); feet small, pale brownish (and not black), with horn-coloured short claws.

The skull, which is that of an adult, shows a shorter muzzle; the molars in both jaws are comparatively smaller; the fronto-parietal suture occurs much further back; the frontal bones are longer and flatter, and the orbital prominence further back; the molar slopes gradually backwards, making a much less angle at its junction with the temporal. The skull is too injured to enable me to give measurements; but enough remains to show that it is distinct from that of E. europæus, with three of which I have compared it.

We left Chefoo by steamer on the night of the 17th October. The 18th was calm and fine; and the following birds appeared about the ship :—1 Asio brachyotus, 1 Skylark, 2 Emberizæ personatæ, 1 Calliope, 1 Ianthia cyanura, 1 Ruticilla aurorea, 1 Coccothraustes vulgaris, 1 Butalis cinereo-alba, 1 Pied Wagtail, and a Thrush. The last, while following the vessel, fell exhausted into the sea. Four male Gold-crests came into the ship, and were so tame that they were easily caught. Bill deep blackish brown; legs yellowish brown, with much lighter toes. In the older birds the shanks are deepercoloured, and the toes light orangc-brown with an orange-yellow wash on soles, the plumage brightens, and the yellowish green on the back mounts higher up. We were within 100 miles of the Shantung coast, which was our nearest land; and it is reasonable to 1870.]

suppose that the birds wandered to us from there. I have never heard of the Gold-crest occurring in China; but this will be sufficient authority to enable us to enrol it on our list. The species is very close to the European *Regulus cristatus*; but Bonaparte separates it as *R. japonicus*. It has purer white on the lores and round the eye, and the hind neck is strongly tinged with grey.

On the 20th October we lauded at Shanghai, and so finished our cruise to Peking and our glimpse at the Northern fauna.

9. On the Saiga Antelope, Saiga tartarica (Pall.). By JAMES MURIE, M.D., F.L.S., F.G.S., &c., late Prosector to the Society.

In the twelfth fasciculus of the 'Spicilegia Zoologica' of P. S. Pallas (published at Berlin in 1777—that is, nearly a hundred years ago) will be found not only an erudite historical and descriptive account of the *Antilope saiga*, considered in its external bearings, but also a very accurate *résumé* of all the anatomical structures of value as regards classification. The author likewise has figured the skull, stomach, and gall-bladder.

Pallas's observations, to my mind, contain the kernel of all that is useful for zoological purposes^{*}. As, however, there still remain points that seem worthy of investigation, I proceed forthwith to tender, as a communication, notes upon two specimens which have come under my inspection.

I may crave indulgence, under these circumstances, as, if some of the data I bring forward are not entirely new, they are doubtless not generally known. A benefit towards science may result from recognizing the correctness of Pallas's statements; whilst a fresh investigation, entering more into detail in some structures, at least admits of a reconsideration of the animal's affinities.

For the latter reason, and because a fuller description of this recent but ancient-like type of mammal may serve as a basis of future comparison to palæontologists as well as zoologists, I have written a lengthy account of the skeleton, which the naturalist above referred to briefly sketches rather than describes. The skull, in particular, offers several points of departure from the Antilopidæ, among which the Saiga is classed; and thus the taxonomic bearings of such aberrance is a factor of some importance.

I. THE SKELETON.

1. Spine and adventitious Bones.

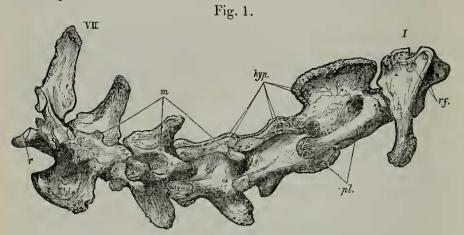
(A) Vertebræ.—The spinal column consists of 7 cervical, 13 dorsal, 6 lumbar, 4 united sacral, and 12 caudal elements, in all equal

* Glitsch, I may mention, recently has usefully supplemented Pallas in a paper on the *Saiga*, chiefly devoted to its geographical distribution (*vidc* Bull. Soc. Hist. Nat. Moscou, 1865, pp. 207-245).

to 42 vertebræ, the last, however, being a mere diminutive ossicle. Pallas* states that there are 5 lumbar vertebræ, without mentioning how many are in the tail.

In a very complete and excellently mounted skeleton \dagger , in the College of Surgeons' Museum, of an adult Saiga, wild, or procured in its native haunts, I find that there but 11 caudal vertebræ, the final 2, as above, being ossified bodies of very minute size. The other vertebral regions agree with what has been mentioned as existing in the Society's animal.

The cervical vertebræ (fig. 1), possess characters by which individually they can readily be distinguished the one from the other. Their long diameters are unequal, as are those of the spinous and other processes.



The cervical vertebræ, about one-third their natural dimensions.

I., VII. First and seventh vertebrae. v.f. Vertebral foramen of atlas. pl. Rudimentary pleurapophyses of axis and third vertebra. hyp. Hyperapophyses or bifid spine-tubercles of second, third, and fourth cervicals. m. Fourth, fifth, and sixth metapophysial elements. r. First rib-facet.

But to proceed seriatim with the Society's male specimen, the atlas is remarkable on account of the great lengthening of the tranverse processes. These are somewhat flattened from above downwards, directed obliquely outwards and backwards, terminating in a roughened slightly bulbous manner. From tip to tip they measure $3\frac{3}{4}$ inches. The spinous process is well nigh obsolete, with deepish muscular depressions in front; the laminæ posteriorly have a low broad arch. The anterior shallow articulating surface presents to the eye a crown-shaped outline, the lower and somewhat obliquely backwardly descending articulating surface of the concavity being mesially divided by a sharp ridge, so that the facets move on the post-basioccipital processes when the head is bent downwards. The

* Op. cit. p. 45.

⁺ This male skeleton (No. 3729 A, interleaved Catalogue) is stated to have been obtained in South Russia, and purchased of Herr Möschler, 2nd October, 1867.

452

vertebral foramina pierce the sides of the body almost vertically, close behind the root of the cranial articulating processes. The postarticular surface of the body is tolerably level and semilunar. A short knobby sessile projection represents the ventral keel (hypapophysis); it is situated far back.

As regards the antero-posterior diameters of the bodies of the cervicals, the following numbers express a sufficiently near approximation to their relative sizes in inches and decimals:—1st, 1.2; 2nd, 2.3; 3rd, 1.6; 4th, 1.6; 5th, 1.5; 6th, 1.3; 7th, 1.0.

By such it is seen that the axis is the longest of the neck-vertebræ, as, indeed, obtains in many of the Ruminantia, although in the longnecked Giraffe and Camelidæ, where the whole of the cervicals are subequally long, it is not so obvious. Its neural spine is also by far the strongest, an inch high, and two antero-posteriorly; thick and stout, with an expanded, roughened, free border, cleft behind (hyperapophyses of Mivart*), but single and produced in front, where it overlies the posterior incised portion of the laminar arch of the atlas. The wide foramen for the vertebral artery enters the spinal canal at the anterior end and upper lateral surface of the body. The odontoid process is short, gouge-shaped, and surrounded by a wide, flattened, semilunar articular surface. The transverse processes are of considerable size, though nevertheless small, as compared with the great wing-like processes of the atlas. Moreover they disagree with these latter in being concave below and more convex above, and in their derivative angle from the body being more acutely backwards. There is only a rudiment of a pleurapophysis at the root of the diapophysis. A deepish ventral spine exists for nearly the whole length of the body. Posteriorly it is bulbous, but in front of this thin, sharp, and laterally compressed.

The third and fourth vertebræ present characters very much akin to each other. They agree in the great reduction of the spine, deeply bifid in both, smallest in the third, but in each only occupying the anterior half of the neural arch—in the great lateral expansion, flattening, or even forward concavity of the neural laminæ in the broadening and more outstanding position of the transverse processes—in possessing large diapophyses—in the production of the keel being slightly less than in the axis, and more concavely marginate.

The distinctive differences are:—in the fourth having the highest spine; but the third, while less high, has the neural laminæ produced forwards as a low process, which fits into the triangular interspace between the posterior articulating (or zygapophysial) facets of the axis; in the laminar arch of the third being slightly broader and less concavely marginal; in there being only an obscure metapophysis in the third, whereas it is fairly developed in the fourth; in the transverse process and diapophysis of the third running antero-posteriorly almost in the same plane, whilst in the fourth they are at a distinctly obtuse angle to each other.

The alteration of the configuration of the fifth cervical consists in * "Axial Skeleton in the Primates," P. Z. S. 1865, p. 576.

shortening of the body and transverse processes—in the latter being more bulbous terminally, and slightly upturned—in lengthening of the spine, which is uncleft— in a gradual increase of laminar arching—in separative distinctness of a metapophysial projection—in an alteration of the position of the transverse process to the pleurapophysis, so that they begin to be superior and inferior to each other instead of antero-posterior—in diminution of the ventral keel, which, however, is more inflated posteriorly.

At the sixth cervical, the inclination of the neck towards the shoulders is apparent. This vertebra altogether is shortened lengthwise and across; but the elongation of the spinous and pleurapophysial elements vastly increases the total depth. The changes observed in the fifth are here continued and augmented : for example, the neural spine is almost twice as long in the sixth; the inferior mesial ridge of the body is reduced to a hardly perceptible linear elevation; the transverse process and pleurapophysis have undergone such relations that the latter is absolutely posterior, its inclination is in that direction, and its breadth twice as great as in the preceding vertebra.

The seventh vertebra, as usual, puts on characters which assimilate it to the dorsal series. The most notable of these is the great elongation and backward direction of the spinous process; next, the total absence of pleurapophysis and foramina for the vertebral arteries; and lastly, the presence of a small costal facet.

Transition to dorsal vertebræ, though manifest in the last cervical, is yet somewhat abrupt, the first dorsal being altogether larger, with proportionally an enormously developed spine Moreover its body, as commencing the dorsal region ventrally, is set at an obtuse angle to those of the neck, the plane of the former being directed upwards and backwards, the latter upwards and forwards.

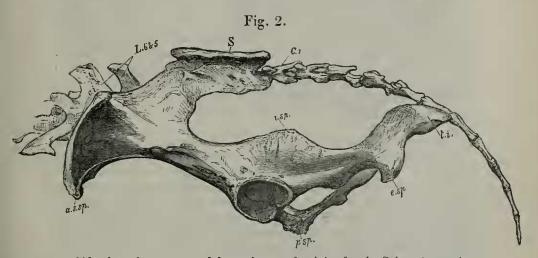
The pattern of the bodies of the dorsal vertebræ is twofold; but they run into each other; viz. as far as the 5th or 6th they are broadish and convex inferiorly, thence to the lumbar region laterally compressed and slightly carinate.

The laminæ throughout correspond to the length and strength of the spinous process. Where this is long and stout, the laminar arch is more acute, and, inversely, lower and arciform as the neurapophysis shortens.

The spine of the first dorsal is very slightly shorter, and tapers more than the 2nd and 3rd, and equals the 4th in length, which latter has a truncate tip. These four spines slant well backwards. At the 8th or 9th vertebra an alteration is apparent, and, from the long spatular shape directed posteriorly, the spines become short, more erect, with an anterior terminal elongation, and at the last dorsal the change to the lumbar type is complete.

That which appertains as a marked feature of the lumbar vertebræ is the length of the transverse processes; at least, this is especially so in the penultimate and two preceding ones. They are thin, relatively narrow, excepting the first, and each terminates in a hastate manner. The first and last are shorter than the intervening four. The hindermost pair of processes are the most delicate of all. Metapophysial prominences of moderate elevation rise up from the root of each transverse process, and they barely pass forwards beyond the zygapophysial articulation. The spines, nearly uniform in height, decrease in breadth from the 1st to the 7th, the last being less than half the breadth of the first.

Though the neurapophyses are pretty vertical, they appear to slant forwards from their anterior extremities being elongated as a blunt spine. The body of the hindermost lumbar vertebra is the stoutest and shortest, those in front subequal in long diameter.



Side view of sacrum, caudal vertebræ, and pelvis of male Saiga: 3/2 nat. size. L. 6 & 5. The sixth and fifth lumbar vertebræ, the pointers being directed to their spines. S. Sacrum. C. 1. First caudal vertebra. a. s. sp. Anterior superior spine of the ilium. c. i. Crest of the ilium. i. sp. Ischial spine. t. i. Tuber ischii. e. sp. External spinous process of ischium. p. sp. Pubic spine.

The four coalesced sacral vertebræ together present the crucial figure which usually obtains in Ruminants. The first of the four vertebral elements, or that which yields the main abutment to the ilia, is a trifle over $\frac{3}{4}$ of an inch lengthwise in body; but transversely the diameter from the margin of one sacro-iliac synchrondrosis to the other is three inches. The pelvic surface is very level and smooth, and the auricular portion or augmented transverse process of moderate dimensions. The second, originally separate, element of the sacrum, here only distinguishable by the presence of the foramina, appears to have a limited share as a buttress against the ilium, just anterior to the bay of the great sciatic notch. It, along with the third and fourth segments of ossification, compose the narrow distal or handle end of the cross-shaped sacrum. The transverse processes and metapophyses are cemented together, so as to represent a doubly shelving mass on either side of the bodies. The four neural spines constitute but one consolidated mass, a couple of inches long, and dorsally thickened.

455

The caudal vertebræ may conveniently be regarded as consisting of two kinds :---those exhibiting enlarged or moderate-sized, and those with very diminished or obsolete processes. Of each there are five or six, according to where the line of demarcation is fixed; for the gradation of change is the opposite of abrupt. The three proximal to the sacrum distinguish themselves by the length of the neural spine, which runs backwards as a narrow, depressed, triangular bar, almost touching the root of the spine posterior to it. The third is rather shorter. The neurapophyses are well developed in each. In the first the transverse process is broad, assimilating to the hinder end of the sacrum. In the succeeding two the transverse processes are smaller and slant outwards and backwards from the distal segments of the body. The fourth, fifth, and sixth vertebræ have altogether much shorter processes, dorsal and lateral. The remaining caudal bodies are more or less expanded at each extremity. The tail as a whole is feeble, and terminally slender.

(B) Costal Arches and Sternum.—Of the thirteen vertebral* ribs the anterior eight have sternal attachments, the remainder come under the heading of floating or free ribs. The front five are more or less vertically placed, the sixth and those posterior by degrees take a wider sweep backwards. To the eighth, counting from before backwards, they progressively increase in length; thence they diminish in quicker ratio to the thirteenth. The last and the third ribs are subequal in length, the first and the second the shortest. The first costal arch, including its presternal keystone, when examined in front or from the interior of the thorax, is short and narrow; the remainder of the costal cavity by degrees enlarges, and is absolutely wide at the last ribs.

The first rib, stoutish and with little of a curve, is $4\frac{1}{2}$ inches in its chord of diameter. It is flat, as are all the ribs within, but it is the most convex externally. Its angle and capitulum are thick; and the sternal end (*vide* fig. 3) is also much clongated.

These characters are considerably reduced in the 2nd and 3rd. The 4th, 5th, 6th, and 7th are remarkably thin, and broaden out distally. The 8th and ribs posterior are much narrower. The angles in all the ribs are badly defined.

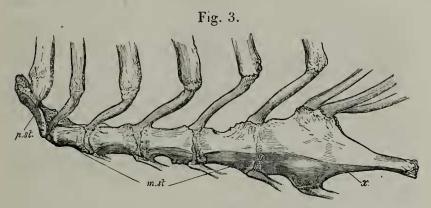
The first sternal rib (Parker), or costal cartilage, abuts against the nppermost præsternum, and is very short. The succeeding four sternal ribs are each about 1 inch long; the 6th, 7th, and 8th lengthen and strengthen considerably, the rest of the free cartilages (sternal ribs) are wider, but long and styliform.

Seven osseous segments can be traced in the adult sternum (fig. 3); the last three, however, are adnate and interossified, those in advance have a meagre cartilaginous separation. The præsternum (p.st.), thick and narrow, is set at an obtuse angle upwards to the other sternal elements. Viewed ventrally, the 1st mesosternal piece (m.st.) has a cup-shaped outline, the narrow end forwards; the

^{*} In using the term "vertebral," in contradistinction to "sternal" rib, I follow the precise morphological nomenclature of my friend Mr. K. Parker, in his valuable monograph 'Shoulder-girdle and Sternum' (1868).

1870.]

others behind are subquadrate, increasing consecutively in length and width, the last being double the width of the first. The xiphosternum (x) flat, and obliquely downwardly bent, has a broad proximal base, which narrows suddenly and, becoming spatular, terminates with a slightly expanded tip.



Three-quarters underview of sternum, with cartilages and portion of the ribs attached. p. st. Præsternum. m. st. Mesosternum. x. Xiphosternum.

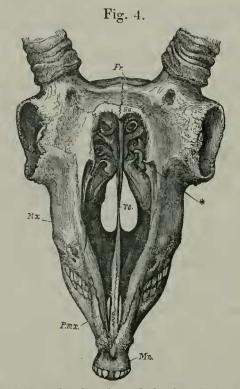
2. Of the Cranial Framework.

(A) Different Aspects of the Skull. — In several particulars the skull of Saiga tartarica is isolated or unique amongst living Ruminants, though, as will be shown hereafter, one or more ancient types foreshadowed the peculiarities. Pallas (l. c. tab. iii. figs. 9 & 10) has given reduced figures of it in profile, and in front foreshortened; and Dr. Gray, in his 'Catalogue of Mammalia in the British Museum,' 1852 (tab. vi. figs. 1 & 2), has likewise represented similar views. In those figures, however, the horns and general outline of the skull seemingly have been more attended to than definition of the coadapted osseous areas; hence fresh representations are, in a great measure, a necessary adjunct to a description of the bony elements of this bizarre Ruminant's skull. The skull of the hornless female and the horned male necessarily exhibit different aspects*.

* Skeletons of the Saiga hitherto have been rare in this country. Besides the Hunterian and the present specimen, I only know of one other, which was obtained some years since by the Museum of the University of Cambridge where in addition are two skulls (nale and female), all being from wild animals. Professor Newton obliged me by kindly transmitting the two latter crania for my inspection. Comparing these with that here described and the College of Surgeons' specimen, I detected little differences worthy of special record other than sexual, *i.e.* diminution of osseous sutural ridges and absence of horns in the female. I may also add that the tympanic bulke in the female were relatively more inflated than in the male; in the latter laterally compressed and very ovine. Ist, the extraordinary shortness of the nasal region, the face, as it were, being scooped out, leaving only an exceedingly narrow extension forwards of the maxillary and premaxillary bones; 2nd, the great vertical depth of the naso-maxillary region; 3rd, the relatively prominent, large, and staring orbit; 4th, the very small, shallow zygomatic arch; 5th, the moderate-sized, roundish, occipito-temporal region; 6th, the long, erect, tapering horns.

In bird's-eye view, or from above, the skull is elongate, somewhat diamond-shaped, the palato-maxillary being considerably longer than the parieto-occipital segments. The orbits form two salient projections, behind and above which the horns start forth.

Examined in front, or facially foreshortened (as in fig. 4), the horns appear to slant well backwards, the frontal bone being rather depressed. The broad orbital rings stand well out. The short nasals are raised, below which the turbinal bones are exposed; and beneath these, between the inner borders of the maxillaries, is an immense narial vacuity. The irregular-surfaced, long, narrow palato-maxillary shelf forms the floor of the forwardly jutting nares.



Foreshortened facial view of skull and manduble of the Society's adult male Saiga.
 Fr. Frontal. Na. Nasal. Mx. Maxillary. Pmx. Præmaxilla, Mn. Mandible.
 Vo Vomer. * Points to pit of lachrymal duct.

From behind, the cranium presents superiorly a broad flattened

arch, the orbital plates forming the outer boundary. The horns issue vertically above the small temporal fossæ. The occipital region is relatively narrow and ovoid; the semilunar condyles are no way prominent, and laterally bound a squarish foramen magnum. The compressed and, in this view, thin, paramastoid processes are but moderately long and perpendicularly set.

The base of the skull (see fig. 6) is characterized—1st, by great orbital breadth; 2nd, by the molar arch enclosing a rounded pterygo-malar space, posteriorly limited by a wide glenoid articulating surface; 3rd, the basioccipital region is broad relatively to its length; 4th, the tympanic bullæ of medium size; 5th, the posterior nares very deep and moderately wide; 6th, dental portion of palate broad, but much narrower in front, slightly concave from behind forwards and across; 7th, the masseteric portions of the maxillaries bulge considerably beyond the alveoli; 8th, the premolar teeth incline inwards, a ridge running on to the premaxillaries; 9th, the premaxillaries are produced forwards, in a flattened beak-like manner.

I may further add, as a feature of some moment, that when the skull rests basally on a horizontal surface (the top of a table for example), the crown and nasals strike upwards, nearly parallel, at about an angle of 20° to the plane. This, so far as I am aware, is not the case with any other living Bovine form; indeed, instead of the parietals and nasal tops exhibiting parallelism of plane, they trend downwards at a more or less obtuse angle from each other. *Alces* and *Rupicapra* offer no exception, though the horns of the latter are well nigh crect.

(B) Individual Bones.—The parietals (Pa.) are short and lowarched. The coronal suture is strongly marked by two semilunar ridges, whose concavities are forwards; and they blend together in a line with the sagittal suture, and run on in a slight ridge towards the prefrontal region.

Between the horns, and partly to their rear, the frontal bone (Fr.) is moderately elevated, with shallow lateral depressions. In advance of their roots, however, the bone shelves rapidly to a lower horizontal level, continuous with the nasals. The osseous horn-core springs obliquely backwards, above and slightly behind the orbit. A large triangular supraorbital foramen is situate at their base, and half an inch beyond the outer raised border of the bone terminates in a small eminence joining the lachrymal. The broad fronto-orbital plate juts well outwards, producing the greatest cranial breadth at this part, as it forms the upper and posterior circuit of the orbit. An irregular bordered wedge-shaped portion of the frontal is inserted betwixt the nasal and lachrymal bones, which, however, falls short of, and is much higher than, the maxillary bone.

The diminishment of the nasals and correlated extensive intermaxillary space, or open narial region, are the most extraordinary features of the skull. The stoutish ossa nasi (Na.), 1-inch long, together constitute an almost equal-sided triangle, instead of an elongate splint of bone surmounting the nasal arch, as in general

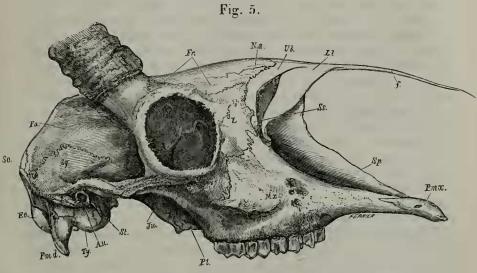
obtains in the Ruminant skull; including the short-nasaled Elk. As already intimated, they are set in a plane horizontal to the anterior portion of the frontals, though, from the descending sweep which the maxillaries take, the nasals appear to have a more upward cast than they in reality possess. Their upper surface is smooth and convex, the fronto-nasal suture being nearly transverse. The anterior free borders are rough for the attachment of the nasal cartilages; and on each outer corner is a small subquadraugular wing-piece, 0.3 inch in diameter, which inferiorly is suturally connected with the lachry-No portion whatsoever of the maxillary or premaxillary bones mal. is in conjunction with the nasals; in this respect, therefore, they differ materially from those of most Ruminants. Even Alces americana, distinguished by shortened nasals and præmaxillæ, does not agree with Saiga, as its maxillæ and nasal bones are partially coadapted, although the præmaxillæ are widely apart from the latter.

Examined from in front, the ethmoid and turbinate bones are large and sinuous, the inferior turbinate, especially, being tilted at an acute angle upwards and forwards. A small portion of their anterior ends projects beyond the interior border of the lachrymal; and to this inferior turbinate portion the upper lateral nasal cartilage is partially adherent. In spite of the very diminished length of the nasals, it is to be observed that their tips reach a point perpendicular to the infraorbital foramina or anterior true molar, the latter, as to a certain extent is the case in the true goats, being as it were, thrust backwards relatively to the facial region.

The development of the lachrymal bone is peculiar and noteworthy. In some senses, by its great vertical depth, does it give that strange aspect in profile to *Saiga* which elevates, as it were, the nasal region of the animal; while at the same time, by its more than ordinary enlargement, the lachrymal entirely excludes the maxillaries from reaching the nasals, as obtains in all the other artiodactyla. In shape, the lachrymal (L) is irregularly contoured, though it exhibits a tendency to a quadrate figure, divided, however, by a portion of the raised thin orbital ring.

The cheek-surface is more or less impressed by three concavities, the chief of which is the ante- or suborbital fossa. This is obovate, shallowish, but broad, and lies at the inferior border of the bone; above it is a small osseous tubercle. The fossa contains the so-called crumen or suborbital gland. About a sixth share of the ring and inner orbital plate is constituted by the lachrymal. The foramen for the lachrymal duct pierces the bone within and just beneath the anteorbital angle. The superior border of the lachrymal joins the frontal, and barely touches the middle outer border of the os nasi. Below, the lachrymal intrudes into the maxillary, as in Antelopes and Sheep, agreeing with the former, however, in the angular abutment of the piece. To the narial side of the ascending process of the maxillary an inlaid splint of the lachrymal descends; and the root of this is pierced by a large foramen (* fig. 4), wherein the lachrymal sac is lodged. This opening, in the fresh condition of the parts, is overlain by the sesamoid nasal cartilage (Ss, fig. 5); whilst the edge of the inferior point of the lower lateral cartilage rests in the groove in front of the foramen.

The malar or jugal bone (Ju) occupies between a fourth and a third of the orbital ring; forms a broad buttress, which rests on the antrum of the maxillary, and sends back a short narrow spur to join the zygomatic process of the temporal.



Skull of male Saiga in profile, with nasal cartilages in situ.

Na. Nasal. Fr. Frontal. L. Lachrymal. Mx. Maxilla. Pmx. Præmaxilla. Pa. Parietal. So. Supraoccipital. Eo. Exoccipital. Sq. Squamosal. Pmd. Paramastoid. Ty. Tympanic. Au. Auditory bulla. St. Styloid. Pt. Pterygo-palatine. Ju. Jugal. Ul. Upper lateral cartilage. Ll. Lower lateral cartilage. f. Fibrous cord of nares. Ss. Sesamoid. Sp. Septal cartilage, its fibrous portion being partially removed.

The premaxillaries (Pmx.), like the nasals, are conspicuous by their small size or abortive development. Each is no more than $1\frac{3}{4}$ inch in extreme length, and, unlike that of any other Ruminant, merely tips the maxillary, without the palatal portion reaching the vomer. Both limbs of each >-shaped premaxillary are much flattened from above downwards, the upper stouter one possessing only a very limited tendency to override the projecting process of the maxilla.

The somewhat scalene-figured cheek-surface of the maxillary bone (Mx) has a pronounced masseteric ridge, which runs well up towards the orbit. In front of its anterior and lower end, perpendicular to the last premolar, are four large sieve-like foramina; and through these the thick infraorbital nerves reach the facial region. I have already spoken of the long nasal or ascending process of the maxillary which dovetails between the divergent lachrymal picces; but the opposite or rostral portion of the maxilla is equally interesting. This latter anterior segment, which forms the anterior palatine roof or prenurial floor, and in a less degree contributes to the outer

PROC. ZOOL. Soc.-1870, No. XXXI.

prenarial wall, is remarkable on account of its outwardly long cylindrical character. In these respects, and in the absolute shearing out of the upper or nasal border of the maxilla, this bone in the Saiga is distinguishable from that of every living Ruminant. The antrum of Highmore, or sinus maxillaris, is very capacious, and the osseous walls altogether thin. A portion of it projects more than usual into the pterygo-maxillary and zygomatic fossa; and this gives, when seen from the palate, a rounder figure to the fossa than obtains in ovine, caprine, or cervine forms. In the Chiru, Panthalops hodgsoni, an analogous inflation and extension of the postmaxilla is observable; and it is further curious to note that both the Saiga and the Chiru are distinguished among antelopes on account of their nasal appendages. Regarding these and the enlarged larvnx of Pallas's A. gutturosa, Turner remarks (P. Z. S. 1850, p. 168)-" These seem to be physiological adaptations, in no case marking a group, and therefore insufficient to warrant generic distinction, which has been made in the two latter instances." So far I agree with that meritorious author; but had he seen the skulls, be would have found other distinctions whereon to base separation.

The palatal plate of the palate bone (Pl.), pierced by the posterior palatine foramen, is relatively large for a bovine. Behind it is broad and widely arching over the rounded front border of the posterior nares, gives much greater breath to this part than is found in the Antilopidæ or even Ovidæ; with its neighbouring plate of the opposite side, they, together crescentiform, reach forwards mesially to opposite the middle of the posterior lobe of the penultimate As far as this latter disposition is concerned, it evinces molars. leanings towards Sheep and Goats rather than Antelopes; moreover in Deer and Cattle these horizontal palatal plates in general pass to opposite a molar beyond the above. The very thin, moderately broad, yet remarkably deep, vertical pterygo-palatine plate of the Saiga, as in other ruminants, mainly forms the inner wall of the sphenomaxillary fossa, being strengthened moreover by the somewhat united stouter pterygoid process of the sphenoid bone.

The opening of the posterior nares is two inches deep, and about one inch wide. Its open rounded palatine end is placed some distance behind the last molar. Thus in position it agrees with its hitherto believed ally the Chiru Antelope; but in shape it disagrees, reverting to the ovine postnarial form. The anterior narial aperture of the Saiga, compared even with its own large posterior narial passage, is of excessive proportions, quite $1\frac{1}{2}$ inch across, and between 2 and 3 in depth; inferiorly the bone is smooth-surfaced.

The slender columellar vomer (Vo), whilst vertically high, is remarkably short antero-posteriorly; and its palatal attachment neither advances to the anterior narial aperture nor recedes to the posterior one. The spheno-rostral part, however, is well seen behind; and in the live animal the anterior bony septal deficiency is made up for by cartilage and soft membranous substance. It is curious, though, that, excepting above, the vomer anteriorly is not grooved nor has everted lips, as is the rule in Ruminants. The squamous portion of the temporal bone (Sq) has a low smoothsurfaced longish elliptical figure, its anterior angle abutting against the alisphenoid. The zygoma arises by a thin broadish horizontal piece, scooped out at its root above, and perforated by a wide foramen; and as the bone arches forward to unite with and overlie the jugal, it thickens. The glenoid (gl) or articular surface is pretty convex, and, with a shallow postglenoid sulcus, much narrower than in Antelopes generally; and the large postglenoid foramen still further reduces it. The articular eminence or tubercle is small, but well marked. The auditory meatus (au) has a moderate diameter, and is directed very gently upwards and forwards. The styloid process or plate is short; and the fossa for the attachment of the articular portion of the stylohyal is likewise as in Sheep, small.

The mastoidal eminence is not nearly so full and prominent as in most Bovidæ; it nevertheless rises in a pronounced roughened ridge, which, however, is scooped out towards the root of the paramastoid. The tympanic bulla (Ty) is rather well developed, and moderately inflated.

The paramastoid process (Pmd.), one inch long, descends almost vertically; seen from behind, it is laterally compressed, with a slight outward obliquity of the posterior border; but from the side, is flat and V-shaped, and partially rests against the tympanic. A wide, deep excavation intervenes between the paramastoid and the condyle; and this cavity narrows to a curved fissure betwixt the tympanic and basioccipital bones.

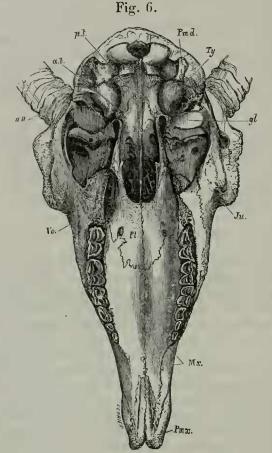
A narrow strip of the supraoccipital (So) forms the hinder portion of the top of the skull. Its lambdoidal suture, in the Society's male specimen, runs transversely with a double forwardly convex curve, this being straighter in the Hunterian skeleton. The superior curved line describes a full arch, is rough, and only moderately prominent; an inferior curved line, less marked, is well nigh obsolete. An external occipital protuberance is but very partially denoted, although the spine is broad and well developed.

The hollows to which the long muscles of the neck and the ligamentum nuchæ cranially fix themselves are distinctly and separately impressed, giving a rugose surface to the occiput, which is altogether broadly arched. The supraoccipital facies is neither so bulging as in Antelopes and Goats, nor so perpendicularly scooped as in Deer It agrees more, therefore, with Sheep, but in the male Saiga has not such strong ridges and concavities as in the thicker-necked Ram.

The articular condyles of the exoccipital (Eo) have each a transverse ungulate figure, which, convex from before backwards and laterally, is yet less prominent or posteriorly sustained than in the Antelopes, coinciding rather with Sheep and Deer. The nearly circular or slightly transversely oval* foramen magnum pertains to *Ovis* in its moderate diameters. Divergently forwards from the inferior root of the condyles, two transversely ridged, large-sized eminences stand out (p. t.), these in disposition and breadth following the type of

* Decidedly ovoid in the Cambridge female skull examined by me.

Cervus. They correspond to Turner's * so-called posterior tubercles of the basioccipital. The basioccipital bone (Bo), an inch long and very nearly as much broad, is slightly bayed on either side, though somewhat broader in front; and is furnished with two additional anterior, externally salient and roughened capitula, Turner's anterior tubercles (a.t.). The basioccipital itself is flat, or has only a very lightly raised mesial linear ridge; and in this feature, as well as continuousf ore breadth, nature of the anterior tubercles, and narrow fissure between these and the tympanics, decidedly conforms to what obtains in Ovis.



Base of the skull of the adult male, reduced less than three-sevenths nat. size, as is fig. 5.

Bo. Basioecipital. p.t, posterior, and a.t, anterior tubercle of basiocciput. Pmd. Paramastoid. Ty. Tympanic. gl. Glenoid. Bs. Basisphenoid. au. Auditory process. Vo. Vomer. Ju. Jugal. Pl. Palatine (horizontal plate). Mx. Maxilla. Pmx. Præmaxilla.

The basisphenoid (Bs), unusnally wide, flat, or linearly raised like the basioccipital, diverges at an obtuse angle from that bone, * P. Z. S. 1850, p. 167.

and only narrows towards the rostral insertion of the vomer, where it is convexly ridged. The long lamellar external and internal pterygoid plates are so closely conjoined as to be with difficulty recognized as separate elements. The former, lanceolate, and $\frac{1}{2}$ inch in greatest breadth, springing in front of the sphenoidal foramen, does not, as in Capra and Ovis, trend so horizontally forwards, but strikes more obliquely down, and suturally connects itself with the vertical palatine plate. Its posterior edge agrees with the Antelope's in being narrow, and not everted, as in Sheep and Goats. The latter, internal spheno-pterygoid plate is even more delicate at its root, and arises close to the posterior edge of the pterygo-palatine plate, thence running backwards at a sharp angle to the external pterygoid plate, lays like a splint inside it, and again curves forwards, to be prolonged into a thicker but nevertheless sleuder rod, terminating in a short hamular process. The alisphenoids, as in Ovis, present only a rudiment of that bony plate so conspicuously developed forwards at the back of the orbit in Pantholops and other of the Antelopes. The sphenoidal wing in Saiga is altogether small, obliquely ridged, contracted antero-posteriorly, and curved sharply backwards between the postfrontal and squamo-temporal elements. The orbito-sphenoid seen from below has a larger superficies than the alisphenoid, though in itself small. It has a smooth concave snrface, the foramen opticum obliquely penetrating it just above the root of the internal spheno-pterygoid plate.

(C) The Mandible.—The dentary portion of the body of the bone, when the mandible is placed in natural position, has a moderate curvilinear direction upwards and forwards. At the last molar its vertical depth is $1\frac{1}{2}$ inch, but, correspondingly, less than 1 inch at the premolar. Anteriorly the diasteme narrows very considerably in a tapering manner, and then widens into a somewhat scooped or shovelshaped symphysial part, 1 inch long and as much wide, into which the horizontally placed incisors are inserted. A diminutive ridge runs backwards from each outer incisor towards the molar alveolus. The mental foramen is situated, outside, immediately behind the symphysis. The ascending ramus, as mentioned, strikes upwards at nearly right angles to the dental plane, the angle being produced as a thin but broad and rounded sweep of bone. The head of the condyle is short-necked, the articular surface transversely oblong and very gently concave. The sigmoid notch is shallow and narrow, the long coronoid process of nearly uniform breadth throughout.

The inferior maxilla in the male measured $7\frac{1}{2}$ inches horizontally from symphysial extremity to ramal angle; and adding an inch for the median incisors, the extreme length would be 8 inches.

(D) Dentition.—In the Society's adult male specimen the set of teeth were deficient in the anterior lower premolar and two middle incisors. I found the skeleton at the College of Surgeons more complete, and answering to Pallas's brief statement of the dental numbers in the full-grown animal. The formula, therefore, of the permanent dentition is that of other hollow-horned Ruminants, to wit :—

I. $\frac{0-0}{3-3}$, C. $\frac{0-0}{1-4}$, P. M. $\frac{3-3}{3-3}$, M. $\frac{3-3}{3-3} = 32$.

The above author observes "molares utrinque 5 in junioribus."

The extreme length of each series of the grinding-teeth above and below is 2.7 inches. The palatal breadth or distance between the two hindermost upper molars is 1.6, and betwixt the opposite anterior premolars 1.1 inch. The pattern of the teeth, as might be anticipated, is bovine, although they do not strictly conform to any special genus; for instance, the upper molars are sheep-like, the premolars rather antilopine, and the incisors a modification of both.

The maxillary premolars are altogether small—the two anterior particularly so; but the third is somewhat larger. The first is single-, the second double-, and the third triple-rooted. Measured seriatim they have individually a breadth of 0.2, 0.3, and 0.4 inch, and a transverse diameter of 0.18, 0.2, and 0.3 inch. Their external longitudinal enamel ridging is but moderately developed, the third premolar being comparatively smooth-surfaced, or with only a slight development of the anterior ridge.

The three true molars behind these together occupy a space of 1.8 inch long; and they increase in size from the first to the third. As in the Bovidæ, their antero-posterior is greater than their transverse diameter; in other words, their breadth is greater than their thickness. Nevertheless they are stout, and relatively and absolutely thick, indeed much more so than obtains in Antelope-skulls of corresponding dimensions. The enamel layers are of considerable density. The two outer depressions are remarkably shallow and broad, and the bounding longitudinal enamel ridges very moderately elevated—notably so in the last molar, its anterior ridge alone being well marked. On the crown the semilunar vertical enamel folds are simple, with a medium-sized cleft or valley; no trace of secondary folds exists. Internal accessory enamel columns, as in the Ox, and supplemental lobes, are wanting.

The crowns of the three upper molars have the following dimensions :—The anterior 0.5, the penultimate 0.7, and the posterior 0.8 inch broad, and each is about 0.4 inch in greatest thickness or transverse diameter.

The lower incisors and canines closely set together form a fanshaped expansion 1.7 inch wide; they are not entirely procumbent, but rather tilted obliquely forwards and upwards. The canines or outermost of the four on each side are the smallest; and the incisors progressively increase in size from without inwards. Their outer edges overlap the median incisor, being lowest. The incisors are all more or less spatulate, with a sharp cutting-edge; their upper outer border, where the neighbouring tooth overrides, is slightly ridged; and from the summit the surface shelves to either side. The largest, innermost incisor is moderately expanded at the summit, the others less so.

A long slender diasteme precedes the mandibular molar series. The first premolar present, situated at the uprising of the ridge, is almost conical, and very small. No trace of its whereabouts could be detected in the mandible of the Society's older animal; and in the skeleton of the wild Saiga at the College of Surgeons, on one side it was very rudimentary; so that I am inclined to think this tooth is lost comparatively early in life. The succeeding premolars, 2 and 3, are of fair size, being a trifle broader, though not quite so thick, as the upper premolars 1 and 2, with which they come into contact during mastication. These latter are short; and the former accordingly are lengthened and raised somewhat above the plane of detrition, chiefly however mesially. The said two hinder lower premolars are each sinuous in contour, from the tolerably pronounced character of the enamel ridges and concavities. The last has well-defined lobes, and is rather larger than that in advance. Together they are 0.6 inch broad, and about 0.2 thick.

The hindermost inferior true molar, quite 1 inch broad and 0.3 inch greatest thickness, has, as in Bovines, a third posterior lobe, of larger size. The penultimate molar is 0.6, the antepenultimate 0.5 inch in antero-posterior diameter, and they are each slightly narrower across than the last tooth of the series.

(E.) Comparison of the Cranium and Dentition -" Sceleton, maxime quoad cranium, singulare est"*. These few words of Pallas comprehend much. When Dr. Falconer + wrote that "in the Sivatherium we have a Ruminant connecting the family with the Pachydermata, and at the same time so marked by individual peculiarities as to be without an analogue in its order," he was at too remote a distance from brother naturalists or easy access to libraries; else he he would at once have recognized in the Antilope saiga certain of those outré features which he and Captain Cautley so graphically describe in the Murkunda fossil. Other, later writers have not failed to note resemblances. In the Saiga, unquestionably, we have a repetition of the short nasals of the Sivathere, and large size of the nasal échancrure; but with these peculiarities further likeness ceases, unless it may be that the lachrymal and præmaxilla bore analogy; these, however, the state of the fossil specimens does not admit of comparing. The Titanotherium proutii of Professor Leidy 1 and Megacerops coloradensis of Dr. Linz§, are representative of two ancient North-American forms which obviously have relations to the above, inasmuch as thickness and diminished length of nasals predominate. The form of teeth in the first two of these fossils is unlike that in Saiga; those of the third are not known. All three, as well as the allied Bramatherium, are furthermore distinguished from Saiga in their possessing four horns, the anterior pair prefrontal.

When we come to compare existing Bovidæ with that under consideration, none have such short nasals, premaxillaries, and scooping out of maxillæ. In these respects there is no connexion whatever with its associates *Gazella*, *Procapra*, *Pantholops*, and *Cervicapra*.

In Pantholops, however, as in Eleotragus and Rupicapra, the

- † Asiatie Researches, vol. xix. (1836), and, with additional MS. notes, in Dr. Murchison's collected edition of his works, 1868.
 - [‡] The Ancient Fauna of Nebraska, p. 72.

§ Acad. of Nat. Sci. Philadelphia, Meeting for Jan. 1870.

^{*} Op. cit. p. 44.

præmaxillæ fall short of the nasals; but in all these Antelopes, the latter bones abut to a considerable extent against the maxillæ.

In the limited section of Caprine Antelopes of Gray, Ovine Antelopes of Turner, *Capricornis, Nemorhædus* and *Budorcas*, the nasals are but of moderate length, the premaxillaries do not reach them, and the maxillæ barely coalesce nasally. In some Oxen, *Bubalus* and *Bibos* to wit, and also in the aberrant Sheep Ovibos, the premaxillary stunting is marked, but the relation of nasals to maxilla is quite different from the peculiar one in Saiga.

The complementary changed relations of the facial bones of Saiga, and especially the increased height but antero-posterior shortening of the lachrymals, differ quite from the modern Ruminant skull, where, as a rule, the horizontal is greater than the upright breadth in the latter bone. Besides these major differences, the Saiga recedes from supposed alliance with *Gazella* and *Cervicapra* in absence of suborbital fissure—thongh, exceptionally, the Chiru agrees with it in wanting a fissure; but it differs from each in the very slight impress of suborbital fossæ.

Indeed, within certain limits, it may be said that the suborbital fossa of *Saiga*, though wider, has more the shallow roundish character of that of Sheep than Antelopes. The opposite of this remark applies to the masseteric ridge, as the higher position of the Antilopine orbit gives increased length of ridge, as in the Saiga.

Goats, with their elongate fissure, and Deer, with a most extensive wide one, and very deep lachrymal fossa, are remote in facial construction from the type in question.

The group which Dr. Gray designates "Antelopes of the field," including Antilope, Gazella, Tetracerus, Cephalophus, and other genera, and the same author's "Antelopes of the Desert," Alcephalus &c., have all large, more or less inflated tympanic bullæ. It is to the former of these groups that the Saiga has been assigned; and the development of its ossa tympani in a fair degree shows derivation from it, or unity of stock. In the Society's specimen the bullæ are rather more inflated than in the skull at the Hunterian Museum; and both are fuller and not quite so laterally compressed as in the so-called Cervine Antelopes, Egocerus, &c. The Caprine Antelopes are still further removed, judged of by this single character; for in them the tympanics are moderate and compressed.

The triangular, horizontally elongated and ridged tympanic bones of the Goats and the Deer even more markedly deviate.

In Sheep, as Turner observes, there is a small auditory bulla; but I find in *Ovis vignei* that the bulla is not only of moderate, but indeed of fair size, and quite equal in relative magnitude to that of the Saiga, its shape rather more elongated, but not unlike the latter.

The centre point of the skull, the basioccipital bone, forms a good diagnostic mark between the Antelope groups, especially when taken in conjunction with the tympanic elements and disposition of the facial bones. Usually the basiocciput is longish and narrow, high, convex, and mesially grooved antero-posteriorly. Continuous ridges bound the groove; and in front and behind a pair of large prominences or tubercles are developed. In the true Ovine, Cervine, and Caprine Antelopes these parts present varied grades of development. The genus *Oreotragus* alone has a tendency to flattening, and *Nemorhædus* evinces relative broadening of the bone.

In the Sheep and the Goats the basilar bone assumes a totally different form; it is as broad as it is long, widest in front, flat or slightly concave, the posterior tubercles small, and the anterior ones extended onwards rather than highly raised. The same bone in the Saiga, as previously described, essentially resembles these.

The Rocky-Mountain Sheep, Ovis montana, offers analogy to the Saiga in having an outer mastoidal depression at the root of the paramastoid. This, partially, is the condition met with in some Oxen; but in Goats there is a great mastoidal eminence: in the Antelopes and Deer it is also convex, but less elevated.

The Saiga, in the backward extension of its horizontal palatines, width of postero-nares, and long, vertically high spheno-pterygoid plates, is interesting, as this is not witnessed to the same extent in living Ruminantia. The short and higher rounding of its skull is also met with in the Chamois, \pounds pyceros and Damalis.

There is something peculiar in the dentition; absence of supplemental lobes separate it from the Cervine Antelopes and all Deer; but the teeth might belong to the Gazelle group, though as closely Ovine in character. In its subequal incisors, however, it is unlike the antilopine section that have the median ones extra large and expanded at the summit.

Altogether, the cranial anatomy of Saiga tartarica has for its groundwork a basioccipital derivatively modelled from Sheep-structure; to this are added mastoid, auditory, and tympanic elements modified between those of Antilope and Ovis. The rest of the broad basis cranii, palatal region, and the foramina are built typical of Sheep, but correlated with change of cranial form. The upward set of the basisphenoid and the postcranial contour incline to those of Goats, though the glenoid articulation and posterior border of the maxilla are truly Antilopine.

The horns and interfrontals pertain to the latter group in shape; but the diaphanons corneous texture, as the older naturalists did not fail to observe, are restrictedly Bovine. Forasmuch as stout abbreviated uasals and præmaxillæ indicate family connexion, the Elk and Oxen show a tendency to agreement with Saiga; but the facial region, notwithstanding, by no means approximates close, and rather, in the latter, denotes ancient Sivathere parentage. In fine, the extraordinary-looking soft structures of the nares and the coordinate adaptation of these with deficiency of osseous framework, as in the Tapirs and other Pachyderms, point to physiological function of the nasal region of a kind different in the extreme from the ordinary living Ruminant type. That in by-gone ages kindred proboscidian Ruminants were more numerous, and varied concomitantly in cranial characteristics, the fossil remains attest. 3. Bones of the Extremities.

(A) Scapula and fore limbs.—Whilst the shoulder-blade shows no special specific or generic mark, it yet, I would say, is impressed more with Antilopine than Ovine form. This, I think, is owing to its somewhat greater length to breadth and upturned axillary border. Its long diameter is 7, and breadth at vertebral end $3\frac{3}{4}$ inches. The supra- is about a third of the breadth of the infraspinous fossa; the spine has a concavity towards the latter; the acromion process is obsolete, a tubercle of bone alone representing it. There is a wellmarked neck, flattish and widened by a flange of bone at the axillary border. The glenoid cavity is shallow, incised at the coracoid end, this process being short and broad. The tricipital border is thick, wide, and markedly grooved, and towards the vertebral end rises at a right angle to the plane of the infraspinous fossa in a prominent strong plate of bone for the attachment of the teres major muscle. The cartilage at the spiual end was semiossified in the male specimen.

The shaft of the humerus is roundish, but with a tendency to posterior angularity. Head and neck relatively to the shaft are massive. The great tuberosity is very broad, strong, and thick, obliquely salient inwards. The deltoid eminence and elevation for attachment of the teres major are each well developed. The bicipital groove is flattish and unusually broad. The articular capitulum is deflected posteriorly, its upper surface being moderately convex and broad; the inferior extremity presents little or no difference from that of the Sheep.

There is a moderately broad shaft to the radius, which has a slight bend forwards, and, as usual, is convex in front, but almost flattened behind. The stout olecranon rises 2 inches above the radius; and the shaft of the ulna is represented by a slender rod continued to the short styloid process, where it somewhat widens out.

The carpal bones consist of the usual ruminant number, 6, viz. the scaphoid, semilunar, cuneiform, and pisiform in the first row, and os magnum (with united trapezoid) and unciform in the second. Proximately the scaphoid, lunar, and cuneiform are arranged in a close-fitting semilune, the pisiform bone being, as it were, accessory, placed posteriorly and comparatively free. The magnum and unciform form an inferior and reduced semilune, modelled accurately to the upper surface of the metacarpal pillar. A sufficient hollow is provided behind these bones for the tendons &c. to be bound firmly by transverse ridges of fascia, and enabling them to play with security during the frequent jerking movements of this part of the limb when in action.

The scaphoid, of good size, has an upper deepish median hollow which lodges the greater part of the inner facet of the radius. The said hollow is somewhat laterally constricted, but posteriorly rises as a tuberosity. The underside of the scaphoid occupies more than the outer moiety of the connate os magnum and trapezoides. The uneven outer side of the bone rests in the corresponding rough concavity of the lunare. The lunare or semilunar bone has a figure-of-eight shape, but with numerous prominent angular facets. It is smaller than the scaphoid. The proximal surface articulates chiefly with the median fossa of the radius and the crest on the outer border of the inner facet. Its lateral constrictions are filled by the corresponding eminences of the scaphoid and cuneiform. Distally it presents two small flattish quadrangular facets, and behind these a couple of grooved ones; these coincide with the approximate parts of the magnum and unciform.

The cuneiform offers two angular faces, which wedge into the neighbouring concavity of the lunare. Proximally the cuneiform articulates by a raised portion with a small part of the radius; and outside this there is a deep oblique groove for the reception of the styloid process of the ulna. The distal surface rests solely upon the unciform bone; a posterior outer and downward process rests in the fossa on the outside of the unciform.

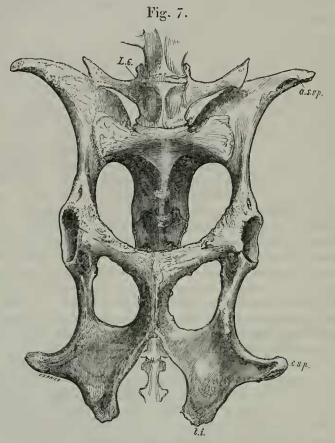
The long diameter of the pisiform is vertical. It is a rather large, ovoid, convex, and laterally compressed bone, the inner surface being deeply grooved for the transmission of tendon.

The os magnum differs from all the bones of the row in being relatively thin, flattish, wide and diamond-shaped. The upper surface is quite level on the outer half for the reception of the scaphoid; and on the inner half it presents fore and aft facets, upon which, as aforesaid, those of the lunare rest. Its articular surface with the unciform is concave. The metacarpal articular surface is quite a horizontal plane, except the trapezoidal portion, which is rather more indented. The homologue of the trapezoid bone is only indicated by a tuberous condition of the inner posterior angle of the magnum.

The unciform, like the magnum, has a very smooth under surface, which plays on the proximal end of the fourth metatarsal (*i. e.* the outer one present). The upper surface of the bone is uneven, and possesses several facets at different angles and planes, which articulate with parts of the lunare and cuneiform. That fossa outside, wherein the descending process of the cuneiform lies, is well marked.

The cannon bone is a long and beautifully finished pillar, a slight mesial groove indicating third and fourth metacarpal elements. A nutritious foramen penetrates the bone at either end of the said furrow. A delicate spicular rod of bone $2\frac{1}{2}$ inches long, and representing a second metacarpal, is seen in the College of Surgeons' skeleton; this must either have been cut away or was absent in the Society's specimen. Behind the digital end of the connate metacarpals are two pairs of large-sized sesamoid bones, each pair appositely placed with a median groove for the long flexor tendons. Futhermore, in the Hunterian specimen three additional free and minute ossicula have been preserved; of these, two are placed on the inner and one on the outer side of the metacarpo-phalangial joint.

The phalanges, proximal, median, and distal, are of fair strength, and, all more or less, laterally compressed. The last or ungual digits are comparatively short and high. Behind the lower extremities of the second phalanges two large sesamoids are met with. (B) Pelvic arch and hind limb.—In treating of the male pelvis it may be as well to mention that the left ischium of the Society's specimen had sustained a fracture, the parts being reunited in a contorted manner. The opposite right pelvic moiety, however, was intact; and from it and the College of Surgeons' skeleton the subjoined description is taken.



Pelvis of male adult Saiga, its lower aspect: two-fifths nat. size. L. 6. Last or sixth lumbar vertebra. a. s. sp. Anterior superior spinous process. t. i. Tuberosity of the ischium. e. sp. External spinous process of ischium.

The brim is placed at an angle of about 50° to the long axis of the lumbar vertebrae. Its conjugate diameters are 3 inches; no marked inequalities exist, so that its roundish outline is complete. The enlarged diamond-shaped blade of the ilium is deeply biconcave without for the deep glutcal muscles; and the sacro-iliac synchondrosis occupies rather less than half of the antero-inner convex surface. A remarkably prominent, elongate anterior superior spinous process (a. s. sp) juts outwards; and the middle of the crest has also a noteworthy tuberosity. The acetabulum is narrow, but deep, the notch large but protected by a thick layer of cartilage. The anterior

[June 9,

or superior limb of the os pubis is stonter than the posterior one. The symphysis, roughened and protuberant in front, is continued backwards, carinate; the pubic arch is very deep, narrow, and \wedge shaped. Each obturator foramen is widely subcircular. The body of the ischinm is thin, with a very sharp superior (or posterior) border, its spine forming a wide upward sweep in the bony curvature. The combined tuber ischii (t. i.) and ramus, flattish below and mesially ridged above, have a reverse plane from the body of the ischium; namely, they are horizontal and widely expanded in a trefoil shape. The inner plate or ramus, the thinnest, joins the pubis; the posterior tuberosity is thick and bulbous; and the third outer spur, which I designate the external tuberosity (e. sp.), has an intermediate thickness and breadth. An angle of 75° approximately gives the separate plane between the iliac and the ischio-symphysial axes.

From within outwards the neck of the femur is very broad, but exceedingly short, it and the head being antero-posteriorly flattened. The articular surface of the latter, consequently, is of a transversely oval shape, depressed, and almost at right angles to the axis of the shaft : a roughening indicates the round ligament. The intertrochanteric fossa burrows deeply at the root of the great trochanter, and from that inwards is more open. The great trochanter is large, and posteriorly rises $\frac{1}{4}$ of an inch higher than the head; its gluteal surface has a long subquadrate outline. Relatively, the trochanter minor is small, and, as in other Ruminants, a third trochanter is wanting. The shaft has a slight forward axial bend; and a long but feebly developed linea aspera descends its whole length on the postero-outer side. The condyles are large and subequal in size; the intercondyloid space narrow and shallow.

With reference to the patella, it is short, stout, and of a nearly equal-sided triangular figure. Its articular surface is but slightly convex. In the fresh condition of the parts the eminence of the outer border is heightened by a wall of cartilage: the prominent ridge thus produced overlaps and grasps the anterior articular rim of the internal condyle, allowing of an upward and downward gliding movement, and preventing luxation from side to side.

The articular crown of the tibia is heart-shaped, but with a deep incision for the tibialis-anticus tendon on its outer border towards the front. This causes the outer, fibular moiety or condyle, which superiorly is the more convex of the two, to be shorter than the inner one; whilst it is also the broader, and has a posterior deepbased margin. The tubercles for the crucial ligaments are well developed. The anterior tuberosity is large, though laterally compressed, sharp-edged; and, from being three-sided and of considerable magnitude above, the shaft narrows and is roundish in its lower twothirds. The muscular grooves are well marked.

Nothing can exceed the compact interlocking, yet easy, ginglymoid movement devised between the distal articulation of the tibia and calcaneum, all chance of lateral dislocation being prevented by the strong internal malleolar plate and the guard of the external side, which is the inferior fibular segment presently to be spoken of. The remnant of, or aborted fibula, as in other Ruminants, is represented by a short stalactic process of bone depending from the external tibial tuberosity, and by a small subquadrate-shaped bone impacted along with the tarsal elements at the tibial distal extremity; the latter, as above said, takes the place of an outer malleolus.

The tarsus is composed of five separate bones, and a sixth if the fibular distal appendage or separate tarsal-like end be included. These altogether are not so stout as in the Sheep or Chamois.

The calcaneum is strong, of moderate length and thickness, and somewhat more than usually narrowed in cross thickness. It mainly articulates with the astragalus; but there is a facet which rests upon the upper surface of the cuboid portion of the combined naviculocuboid bone, and another for the infrafibular ossicle.

The astragalus has the ordinary Ruminant type, but relatively is of small size, though its ligamentons pits and impressions are deepish. Its distal articulation is chiefly with the navicular portion of the scapho-cuboid.

This combined scapho- or navicular cuboid bone is deep compared with its size. Its upper surface, or face of articulation with the astragalus, is biconcave and considerably scooped out.

The single metatarsal shows little or no sign of segmentation. Like the metacarpal, it is of considerable length, but much the more laterally compressed, or its antero-posterior diameter is the greater. This fore-and-aft depth decreases from above downwards, and at the base or distal end becomes altered, so that it is broader across than from front to back. The upper two-thirds of the posterior surface is fluted; and at the top of the groove there rests a small sesamoid bone. The trochlear or digital articular eminences are deep, but not wide. Two pairs of sesamoid bones, affording pulley-superficies for the flexor tendons, lie behind the distal enlargement.

As regards length, lateral compression, shape and number, the digits and phalanges of the hind foot agree closely with those of the fore foot.

(C) The limb-structure compared.—In reviewing the appendicular structures I may, first, refer to the Table which I have drawn up to exhibit the comparative lengths of the limb-segments in a series of Ruminants. (See p. 475.)

Saiga is there placed alongside the Sheep. The numbers attached to the names refer to the individual skeletons in the College of Surgeons' Museum, from which these measurements were taken. A single species of each group may serve for comparison, though of course this implies approximate rather than exact inferences.

With regard to greatest breadth of scapula to its length, allowing the long diameter to be represented by 100, these are as undernoted :---

38.1 Giraffe.	59.8 Bull.	68.0 Sheep.
56·4 Goat.	60.0 Saiga.	68·1 Musk-Deer.
59.0 Gazelle.	67.1 Fallow Deer.	69·6 Llama.

These proportions, added to the general appearance heretofore men-

Femur Tibia Metatarsal Proximal phalanx	Scapula Trans. diameter at base Humerus Radius Ulna Metacarpal Proximal phalanx		
16-2 9-7 2-7	$\begin{array}{c} 117.2 \\ 10.3 \\ 13.0 \\ 13.2 \\ 9.2 \\ 3.0 \\ 3.0 \end{array}$	Italian Bull (3825, A), Bos taurus.	Bov
10.5 12.0 2.4	$11.2 \\ 10.5 \\ 13.5 \\ $	White-tailed Gnu (3808), Catoblepas gnu.	Bovidæ.
1-6 1-6	$\begin{array}{c} 15570\\ 15$	Sheep (3751), Ovis aries.	Ovi
1-6 1-6	1 57 8 6 6 4 6 5 15 5 5 15 15 0	Nahura Argali (3779), Ovis nahura.	Ovidæ.
1.5 1.5 1.5	$\begin{array}{c} 16.8 \\ 16.2 \\ 8.0 \\ 1.2$	Saiga (3729, A), Saiga tartarica.	
7:3 4:4 1:4	14765536 4160855	Goat (3736), Capra hircus.	Capridæ.
$ \begin{array}{r} $	1597636 7679978	Nepaul Goat (3748), <i>Capra nepalensis.</i>	idæ.
$13.2 \\ 15.4 \\ 11.5 \\ 2.8 \\ 2.8 $	$13.3 \\ 7.2 \\ 10.4 \\ 14.0 \\ 17.0 \\ 11.1 \\ 2.7 \\ 2.7 \\$	Equine Antelope (3696), Ægocerus equinus.	An
1-2-5-6 1-2-2-6	1.3 6.0 1.3	Gazelle (3648), Gazella (Antilope) dorcas.	Antilopidæ
5.7 6.1 1.4	1575424	Chickara (3715), Tetraccrus quadricornis.	æ.
1-6.9.7 4-3.5 4-3.5	1686685 6805050	Roe Deer (3598), Cervus capreolus.	
$9.4 \\ 10.2 \\ 8.5 \\ 1.7 \\ 1.7$	$\begin{array}{c} 7.6 \\ 5.1 \\ 7.8 \\ 10.0 \\ 1.6 \\ 1.6 \end{array}$	Fallow Deer (3536), Cervus dama.	Cervidæ.
10.4 12.0 10.4 2.1	971997 11987 119777 1197	Reindeer (3112), Tarandus rangifer.	10
19-6 22-6 25-6 4-2	222-3 8-5 227-5 32-6 25-0 4-7	Giraffe (3617), Camelopardalis giraffa.	Giraf- fidæ.
$1.4 \\ 5.5 \\ 1.4 $	14651704 15221704	Musk-Deer (3490), Moschus moschiferus.	Mos- chidæ.
$10.4 \\ 10.7 \\ 7.7 \\ 2.3 \\ 2.3$	9757 9752 98 96 99	Vicugna (3489), Auchenia vicugna.	Ca
$12.3 \\ 12.3 \\ 3.0 \\ 3.$	$\begin{array}{c} 8.9 \\ 6.9 \\ 9.2 \\ 11.0 \\ 8.8 \\ 2.8 \\ 2.8 \end{array}$	Llama (3482), Auchenia llama.	Camelidæ.
17-9 12-3 3-0	14-7 9-3 17-6 13-2 3-6	Camel (3445), Camelus bactrianus.	æ

tioned, eharacterize the blade-bone as Antilopine rather than Ovine or Cervine.

It is difficult verbally to define differences in the long limb-bones of animals disagreeing in size but with such similarity of construction as obtains in the subsidiary groups of the Bovidæ. The relation of the segments to each other possibly is the most satisfactory test. From such a standard, in Ruminants generally, the following results appear :—

Proportion of the radius to humerus, the latter equivalent to 100.

89.4 Musk-Deer.	113.0 Fallow Deer.	119·5 Llama.
101.5 Bull.	114.7 Saiga.	128.2 Gazelle.
103.4 Goat.	116.6 Sheep.	209 9 Giraffe.

The Giraffe towers in radial length. The Gazelle, typical of the Antelopes, follows, with, however, great diminishment of the radius, yet considerably removed from *Saiga*, which, with the Sheep and Deer, take an intermediate position in the above Ruminant scale. The aberrant *Moschus* is in extreme from the equally abnormal Giraffe.

Proportion of the metaearpal to radius, the latter equivalent to 100.

68.3 Goat.	81.4 Sheep.	90.9 Giraffe.
69.6 Bull.	82·3 Musk-Deer	98.7 Fallow Deer.
80.0 Llama.	88.5 Saiga.	120.0 Gazelle.

As regards proportion of cannon bone to radius, Sheep and the Saiga again occupy a middle place, and the Gazelle far exceeds these, the Cervidæ, and even the long-fore-legged Camelopard.

Proportion of tibia to femur, the latter equivalent to 100.

92.5 Bull.	111 [.] 3 Saiga.	120.2 Sheep.
102.4 Llama.	113.7 Goat.	123.6 Musk-Deer.
108.5 Fallow Deer.	115.3 Giraffe.	128.5 Gazelle.

The Saiga, in its femoro-tibial segments, departs from *Ovis*, and is widely separate from *Gazella*, its alliances, as in the fore limb, being with *Cervus* and *Capra*. The changes in relationship of the Giraffe, Musk-Deer, and Llama are not a little remarkable.

Proportion of the metatarsal to tibia, the latter equivalent to 100.

53.0 Goat.	65.4 Musk-Deer.	83·3 Fallow Deer.
59.8 Bull.	70.6 Llama.	86·1 Gazelle.
61.0 Sheep.	79.5 Saiga.	113.0 Giraffe.

There is a certain correspondence between the cannon bones of the hind and fore limbs, contrasted with their osseous pillar above, in all the Ruminauts selected for comparison. The Giraffe, however, presents the maximum, and not the Gazelle.

Limiting my remarks to the Saiga, it comes out, in whichever light viewed, that this animal, in the proportional lengths of its long limb-bones, has much nearer affinities to Sheep than to Antelopes. This with a certainty is the case in the fore leg, though in the hind leg it has closer agreement with Deer than with either of the said groups. It is necessary to speak with caution of the inferences deducible from pelvic formation, as sex, age, &c. render data unstable, unless an extensive series are studied side by side. The pelvis of the young female Saiga resembles that of the adult female Red Deer; but the adult male Saiga's does not agree with it. The ilia of most Deer are shorter, the pubic angle wider, the brim is not so round, the symphysial ridge and the ischial tuberosities relatively less pronounced.

Sheep contrasted with Saiga have a more oval contour of brin, their anterior superior spinous processes, external ischial spine, and postischial tuberosity are, as in it, large, yet less produced; the pubic angle is narrow and short. A greater differentiation obtains in the Goat, Ibex, and Chamois, where the bony processes are less developed and the pubic angle is wider.

11. NASAL CHAMBERS AND MYOLOGY.

1. The Nares.

Outer aspect.—The organ, par excellence, which first excites attention and gives a peculiar character to the Saiga is its trunk-like proboscis (fig. 12). No existing Ruminant, to my knowledge, is furnished with such an exaggerated nasal apparatus, though some few have the upper lip more than ordinarily elongated. It is, however, to the ample soft narial walls that the Pig-like or proboscidean face is due in Saiga. As in Swine, its extremity is abruptly truncated; but it differs very materially from theirs in being soft and flabby, without a discoid fibro-cartilaginous expanse; and the nasal orifices are very patulous. Neither is the Saiga's nasal enlargement quite after the type of the Elephant and Tapir, where the trunk is provided with a tactile retracting tip. The Horse, again, bears a resemblance to the Saiga in its greatly dilated nostrils, which, however, are more cartilaginous; and its upper lip is much more callous and prehensile.

Externally and in front the nose and muzzle of the Saiga have a semilunar contour, the lip broad, hairy, and mesially grooved, but not deeply fissured. The nares have an extreme transverse diameter of 2 inches, and each is an inch in depth. Each wide nostril is suboval, and, when dilated, inclines upwards and outwards, where it is rather wider than at the septum. This latter exteriorly is moderately thick, but thin interiorly for 2 or 3 inches backwards. The nasal passages are about 4 inches long from the external orifice to the nasal cartilages, 2 inches deep, the width depending greatly upon the contraction of the facial muscles; for the passages themselves are very lax and pliant in the dead body. The accurate Pallas has not passed unnoticed that the floor and outer wall are clothed with longish silky white hairs, and studded with sebaceous follicles, the septum naked, and that there is a peculiar maxillary sac opening within the cavity of each naris.

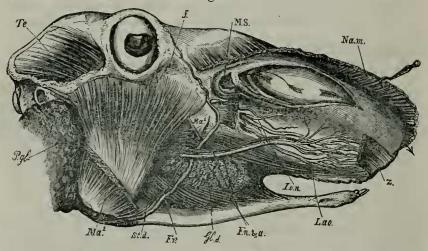
Nasal sac.—This sac possesses much interest, as helping, with others, to a better understanding of the homology of the Cetaccan nasal sacs, which I have treated upon and compared with this else-

PROC. ZOOL. SOC.-1870, No. XXXII.

[June 9,

where. In the young female the sac and its opening similarly placed (see fig. 8, MS) were smaller than in the adult male; but I shall choose the latter for description. It is placed deeply beneath the nasal muscles and tissues, above the premaxillary bone, and vertically under the alar cartilage. It is globular in shape, an inch deep, and with a large vertical ellipsoidal aperture opening into the nasal passage below the anterior inferior margin of the alar cartilage. Interiorly it is lined with an extension of the mucous membrane, and is studded with glands similarly to the hairy portion of the nares. The glands secrete abundantly a sebaceous-looking substance which Pallas says has a rancid goat-like odour; and in this I concur, though in Sheep the smell from the nares is not dissimilar. The inferior turbinal bones and mucous lining narrow the nostril behind the opening of the sac; but it is worthy of notice that a small vertically semilunar depression, $\frac{1}{2}$ an inch long, exists between them outside the turbinal and superior to the orifice of the sac. There is also another much wider fossa or duplication of membrane on the floor of the chamber mesially and in front of the first-mentioned premaxillary sac. In fact, a semilunar membranous fold forms a well-defined step between the raised anterior narial chamber and deeper posterior nares. The soft membranous postseptum is very thick compared with the front part; its vessels are arranged in very numerous obliquely parallel lines.





Dissection, head of female Saiga, showing nasal sac and nervous distribution.

M S. Maxillary sinus, or extra nasal sac; a portion of its onter wall is removed, and an arrow from the nares shows the connexion therewith; parts of two other arrows indicate the separate nasal passages. f. Suborbital fossa or pit. Na. m. Nasal muscles, reflected and partially cut off. z. Origin and insertion of zygomaticus. I. o. n. Infraorbital nerves. F. n. f. a. Facial nerve and artery, a dotted line carrying them towards their cranial exit. P. gl. Parotid gland; and Gl. s. Glandula socia. F. v. Facial ven. St. d. Stenon's duct. Ma¹ and Ma². Superficial and deep layers of the masseter. Te. Temporalis. Nasal cartilages.—As has been shown, the lengthened capacious nasal organ of the Saiga is chiefly built up of soft substances, namely muscular, fibrous, and fatty structures, with an internal lining of sensitive, partially hairy, mucous membrane. The cartilages of the nose take but a minor part in its composition. It may be as well, however, that I describe these; and in so doing I refer to figure 5. This will enable the reader to comprehend the relation of the parts at the root of the nose, when the soft nares are removed, the cartilages alone remaining in contact with the bones.

The septum narium (Sp) is remarkably long and deep; anteriorly and superiorly it is membranous, the more solid cartilaginous portion, or *septal cartilage*, being limited to a lengthened wedge-shaped splint. This arises from the vomer; trends forwards and downwards on the floor of the nares to the anterior median groove separating the premaxillary bones.

At the summit of the nasal region, above and in front, the septal narial cartilage projects for about an inch beyond the nasal bones. It is narrow and acutely wedge-shaped, the basal end but moderately broad, the point mingling with or being wedged between two elon-gated fibro-cartilaginous cords (f) presently to be spoken of.

The two *upper* and posterior *lateral cartilages* (*Ul*) have each a shallow but widish semilunar contour, and partially fill the irregularly margined concavity betwist the orbito-maxillary and nasal bones. The anterior horn of the crescent abuts against the median nasal cartilage, and outwardly is bounded by the alar cartilage. The post-infero-horn runs down towards the premaxillary, and by a constricted isthmus joins what appears to represent a sesamoid cartilage, though in strictness this is little other than an inferior continuation of the upper lateral cartilage itself.

The so-called *sesamoid cartilage* (Ss) is of small size, narrow, and arciform, and fits into a deepish pit of the bone at the lachrymomaxillary orifice of the nasal duct, see *, fig. 4.

The alar or lower lateral anterior cartilages (Ll) are the largest and thickest of the three pairs of nasal cartilages. Each possesses an elongated lozenge-shape, or is irregularly diamond-figured. The axis of the long diameter passes in a line nearly parallel with that between the apex of the nasal bones and the inferior border of the orbit, but is fully $\frac{1}{2}$ an inch in front of these. The upper anterior angle of the alar cartilage, as has been intimated, is joined by an anterior slip from the upper lateral cartilage; and the united but produced portion lying outside the point of the superior portion of the septum narium is continued onwards. The pair of narrow cords (f), one on each of the median lines, are fibrous in texture and very elastic; and they proceed among the tissues of the summit of the nares, as far almost as the truncated extremity of the nares, laterally dwindling to a delicate film of glistening fibrous tissue. The inferior angle of the alar cartilage is curvilinear, the concavity forward and, broadening slightly below, bends inwards towards the nasa chamber.

[June 9,

It is difficult accurately to define the margin of each of the cartilages as they graduate into thickish fibroid tissue at their free edges. A rough measurement in the male animal gave the following results:—Alar cartilage 2 inches in long diameter by $\frac{1}{2}$ inch at point of greatest breadth; posterior lateral cartilage $1\frac{1}{2}$ by $\frac{1}{2}$ inch in the same diameters, the sesamoid or extension of the last 0.6 long by 0.2 inch at widest.

Separating the alar and lateral cartilages, on both sides of the nares is an elliptical fossa or shallow depression placed almost perpendicularly to the long axis of the cranium. This depression, indicated only by a dark shadow in fig. 5, consists of strongish fibrons tissne, but is filled ordinarily with fatty substance and delicate pale-coloured muscular fibres. These last, as shall hereafter be more particularly pointed out, may be homologous with the levator proprius alæ nasi anterior, and levator proprius alæ nasi posterior, or the true dilators of the nares, although here situated far behind the external narial apertures.

The fibres in question still have the same function in relation to the cartilages of the nose, namely, movement of the alæ. The long fibrous cords conjointly derived from the alar and postlateral cartilages appear to form a superior longitudinal line of support to the soft nasal walls. They, being highly elastic, permit, and indeed assist, the muscular coverings in retracting efficiently.

Sense of smell.—Discussing the parts appertaining to the sense of smell, it here seems appropriate to say a word on such habits of the animal as bear thereou. The nose of Saiga, I find on good authority, is an excellent telltale, as the information my esteemed colleague, Mr. A. D. Bartlett, furnishes me with proves. He says, "One of the difficulties attendant upon keeping the Saiga in good health is its daintiness. Not only is it necessary to find suitable food, but that food must be perfectly fresh and untouched by other animals; for if a mouse, rat, or even a sparrow, feed out of the same trough, or touches the provender, the Saiga will not eat it. So delicate is the sense of its smell, and so carefully must every particle be handled, that I regard it as one of the most dainty feeders I have ever met with among animals during my long experience in these Gardens."

Another circumstance tending to show a keen sense of smell is, that when any disagreeably odorous substance is offered or thrown to the animal it seems quickly to appreciate its qualities. Although its curiosity be excited, it does not approach closely and sniff it, as most Antelopes or Deer would, but remains at a distance inspiring freely with dilated nostrils.

2. Muscular and other structures of the face and body generally.

I have explained at length the peculiarities of the internal nares; but the structure of the external walls also demands a few remarks. The soft flabby nature of the proboscis has been alluded to as dif-

1870.]

fering from that of other animals with a like nasal elongation, as notably the Pig, Horse, and allied Ruminants. The Tapir probably presents the nearest resemblance, minus lengthening and tactile apex; this, as has been shown, is chiefly owing to the shortening of the nasal bones and cartilages. Proceeding, however, with an enumeration of the parts from the superficial towards the deep, I shall state broadly that the muscles, vessels, and nerves closely assimilate in their disposition to those in the common Goat and Sheep; but the development of analogous parts does not quite correspond.

In the Saiga there is a great broad sheet of muscular fibres which arise from the naso-, orbital, and maxillary regions, and, proceeding forwards, clothe the entire surface of the unusually vertically deep nares (vide fig. 8, Na. m). Posteriorly the fibres are thin, but they acquire bulk as they go forwards and downwards. To the lower border of the above, and, indeed, intimately connected with it, is a narrowed but also thick plane of muscular substance, which springs from the maxillary eminence and goes to the outer inferior side of the nostrils (z, fig. 8). Its direction is somewhat obliquely upwards or convergent to the first named. These two muscles respectively correspond to the *levator labii superioris alæque nasi*, and conjoined zygomatici. The lower one may also include the *levator labii superioris proprius*, whilst the upper one, in its deep transverse pale-coloured fibres, undoubtedly comprises the homologues of the *pyramidalis nasi*, compressor naris, and dilator naris.

The last-mentioned three muscles, though most intimately interwoven with the coarser upper layer of the *levator labii superioris alæque nasi*, and in a manner inseparable from it, can yet be readily distinguished, as they are much paler in colour, finer in texture, and set obliquely or at right angles outwards to the narial wall. The alar cartilages, it is true, are situated far back; nevertheless the posterior portion of the dilator naris (or *levator proprius alæ nasi posterior*) is clearly present, filling the deep fissure between the maxillary bone and the curved tapering alar cartilage. The anterior portion of the dilator (*levator proprius alæ nasi anterior*) abuts against the soft walls of the naris. The *depressor alæ nasi*, and socalled *naso-labialis* of human anatomy, cannot be defined.

In the Sheep and Goat the levator labii superioris alæque nasi is very small compared with the Saiga's; and the other deep nasal muscles proper, from the cartilages being carried forwards, are very diminutive indeed in the former animals. The zygomatic and levator labii proprius muscles, however, are coequal, probably even thicker in the Goat, which, as a browser, as Ogilby remarks*, uses its upper lip to a remarkable extent.

The trunk of the Elephant and Tapir, whilst absolutely composed of the same homologous elements, has quite a different appearance when cut into, either transversely or laterally. In them there is a vast accession of prominently marked muscular slips, and glistening interlacing cross fibres intermingled with large blood-

* Trans. Zool. Soc. vol. iii. p. 58.

vessels, which give the whole quite a banded network character; whereas in the Saiga the fibres of the nasal muscles proper and bloodvessels are so minute as to have more of a glandular aspect.

In the Pachyderms the proboscis is as much an organ of touch and prehension as of smell. In Saiga undoubtedly touch or the sense of feeling must be possessed to an unusual degree in this musculo-sensory nasal apparatus. The increase of powers of smell, however, seems to be its office; for the Schneiderian membrane is that which most gains in superficial capacity, the power of retraction and movement, though ossessed by it, being secondary or adjunct.

The distribution of aerves to the outside of this dilated nosechamber is peculiar, inasmuch as the facial nerve (F.n.) is enormously developed. Piercing the parotid gland behind the ascending ramus of the mandible, it traverses, as in Sheep and Goats, superficially across the masseter to above the angle of the mouth, then, directed obliquely upwards and formards, splits into a vast number of thick branches. But the fan-shaped nervous plexus which spread over the entire face are by no means so few or so small as in Ovidæ, compared with which they are of gigantic proportions. While some proceed towards the upper lip, the greater number pass underneath the zygomatic and l. l. s. alæque nasi muscles, and, piercing the deep nasal muscles, ramify finally on the fibrous wall of the nares, both laterally and in front. In fact they similate the nervous distribution on the Pig's mobile and sensory snout; only in Saiga many more go to the lateral aspect of the nares, and comparatively fewer to the extremity of the nose. In most Bovines the infraorbital nerves are large relatively to the temporo-facial; but in S. tartarica the reverse obtains (fig. 8, I. o. n). This may be accounted for by the upper lip of the former requiring greater nervo-muscular power; whereas in the latter, as has been shown, the nose acquires prominence, being the active sensory and mobile organ.

Among cranio-facial muscles other than those mentioned, the temporalis (Te), as in Ruminants generally, has a small superficial area. The masseter is double; its superficial layer (Ma^1), broad and thick, arises by a strong tendon from the maxillary prominence, and by fibres from the lower edge of the orbit; posteriorly and below it has a wide insertion into the angle of the mandible. The second, deeper layer (Ma^2) has more vertically directed fibres; they arise from the anterior half of the zygomatic arch and lower surface of the orbit, and are inserted into the anterior half of the ascending mandibular ramus. The *buccinator* is moderately thick, elongated, and narrowed behind. The inferior labial group of muscles are but moderate in size.

The sterno-mastoid, as Owen remarks in the Giraffe, is according to attachment a sterno-maxillaris, each belly posteriorly being in close union with the sterno-hyoidei, and anteriorly ending by a strong tendon, which amalgamates with that of the masseter primus, they together being firmly fixed to the maxillary eminence. This facial attachment must have a powerful influence in fixing the head upon the neck.

The pectoralis major is small compared with the p. minor; its origin reaches only to opposite the fourth rib; and its broad insertion is round the fleshy parts at the head of the humerus. The pectoralis minor is much more elongate, triangular, and stronger than the p. major. It extends backwards to the xiphoid cartilage, and, in partial union on the side of the chest with the latissimus dorsi, proceeds forwards, and is inserted into the head of the humerus above the supraspinatus. As in Ungulata, there is a sterno-scapular muscle present. This, a small fleshy band or slip, arises from the anterior outer side of the manubrium, and, passing outwards, goes between the scapula and head of the humerus, being lost in the tissues superficial to the pectoralis minor. A distinct supracostal, some inches long, lies upon the first four or five ribs, as in many Ruminants. It is fleshy to the second rib, and broadly tendinous behind that, inclining from without inwards. The servatus magnus is both extensive, thick, and fleshy. It is situated between the seventh rib and the axis, its subscapular fold covering the bone from the vertebral border to its middle. The latissimus dorsi comes from the tenth rib forward, is relatively narrow, and joins, as aforesaid, the pectoralis minor, to be inserted into the humerus.

The biceps is single-headed and strong. The brachialis anticus has origin from the post-outer surface of the humeral neck, and, with a moderately fleshy belly, is fixed into the anterior radial head. The coraco-brachialis is large and fleshy. Origin coracoid process; insertion to middle of humerus. The long narrow deltoid stretches between the lower border of the scapula and the deltoid ridge. The triceps is four-headed; and there is, besides, a band-like slip representing the dorsi-epitrochlear muscle. The scapular head of the triceps is of enormous bulk; and the dorso-epitrochlear band lies deeply adherent to it. The supraspinatus has a partially double insertion on to the head of the humerus, as in the Giraffe.

There is the representative of a *cephalo-humeral*, which rolls round the head of the humerus, and is inserted between the biceps and brachialis anticus and triceps on the shaft of the bone below the deltoid ridge. The long spinal muscles of the back are remarkably broad, well developed, and fleshy; the *psoas* and *iliacus* moderately so, though wide.

There is a thick layer of firm fat overspreading the entire body, but only partially so on the limbs; it lies beneath the extensive muscular panniculus carnosus. The cutaneous *panniculus* is of moderate thickness, and fleshy chiefly on the side of the body. It sends a thin slip towards the elbow; and there is a broad attachment, both into the groin and onwards to the knee-joint.

Other muscles have been described, among the organs of generation and laryngeal structures. The remainder of them and the tendons of the limbs were but roughly dissected, as both skeleton and skin had to be prepared for the British Museum. III. VISCERAL ANATOMY.

1. Vascular Channels.

The heart, 4 to $4\frac{1}{2}$ inches long and $2\frac{1}{2}$ inches in diameter at the base, approaches more to the Antelopes' and Deer's in shape than to that of the Sheep. This arises from its being elongate, pyramidal, and taper pointed; for in the Sheep the apex is more blunt and obtuse. The deposition of fat around the basal end and on the pericardium is limited in quantity. A thin ossicle an inch long and '2 inch broad at its middle, lay within the muscular substance, close to the aortic orifice, in the adult male. The bone, as regards shape, was not unlike a diminutive broad first rib, one end being wider and twisted, like the costal head, the opposite extremity narrower.

Fig. 9.

Bone of the heart---nat. size.

A single superior vena cava and an inferior one enter the right auricle from above and below. The facial veins and arteries (see fig. 8), follow the distribution met with in Bovidæ generally.

That vasculo-glandular reservoir the spleen, as Pallas shows (l. c. p. 43, tab. iii. fig. 11 e), is adherent to the left upper side of the paunch, a couple of inches from the cardiac orifice. It is flat and broad, some 6 by 4 inches in diameter.

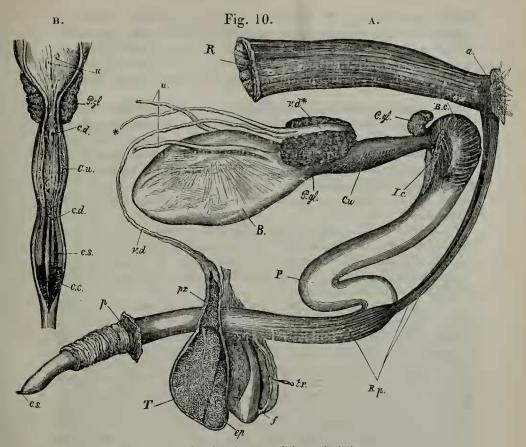
2. Genito-urinary Apparatus.

In the female the clitoris, the vagina, and the bicorned uterus, present no special features worthy of notice. The specimen examined, a young half-grown animal, had imperfectly developed mammary glands, upon which were four teats.

In the male Saiga, Pallas curtly adverts to the testes, penis, and its præputium; but he omits reference to the prostate and Cowper's glands, which are present. (*Vide* fig. 10.)

The scrotum is subglobular, and rather sessile than pendent. As Pallas observes, it is large—in the adult examined by me, equalling a small orange in size, and exteriorly covered by short white hairs. A considerable quantity of firm fat is imbedded within the scrotal sac, being deposited in greatest quantity at the root of the testes and around the cord. It forms indeed a septal division between the glands, and gives bulk to the scrotum.

The cremaster muscle is developed as a broad band descending as low as to opposite the globus major. The strongly fibrous tunica vaginalis (t. v. reflexa) is semitranslucent; its visceral portion (t. vag. propria) is still more delicate, and the lower uniting fold (f) situated about $\cdot 4$ inch from the inferior end of the globus minor.



Reproductive Organs of the male Saiga.

- A. Reduced sketch of a dissection of the parts, bearing somewhat their natural relations. R. Rectum. a. Anus. T. Left testis mesially bisected; the right is partially shown with its sac reflected. ep. Epididymis at globus minor. t.v. Tunica vaginalis dragged backwards; gyri of the spermatic vcin are delineated upon the testicular surface. f. Fold between t. v. propria and t. v. reflexa. px. Plexus of spermatic vcssels. v. d, v. d*. Vas deferens; the right tube * has been severed. B. Bladder in its contracted condition. u. Ureters, cut short. P. gl. Prostate gland. C. gl. Cowper's gland. P. Penis, its sigmoid flexure. p. Præputium, retroverted. c. s. Terminal lip of the corpus spongiosum; the urethral orifice opens at its point. R p. Retractor muscles of penis. B. c. Bulbo-cavernosus. I. c. Ischio-cavernosus, cut from its bony attachment. C. u. Constrictor urethræ.
- B. Segment of the urethra and bladder opened from above. u. Orifices of the ureters. P. gl. Prostate gland. e. d. Ejaculatory ducts. C. u. Constrictor urethræ muscle seen in section. c. s. Corpus spongiosum. c. e. Corpus cavernosum. c. d. Cowper's ducts.

Each testicle, with its globus minor, is egg- or, rather, spindleshaped, and measures $1\frac{3}{4}$ inch long by 1 inch in broadest diameter. The body of the epididymis is broadish and band-like, the globus major and minor both being of considerable dimensions. The latter (ep. fig. 10) descends $\frac{1}{4}$ of an inch below the gland, and is backwardly protuberant. The white fibrous septum known as the corpus highmorianum, is linear, rather indistinct, and occupies the mesial axis. Owen † remarks of the Giraffe, where the septum is similarly situated, that, as in the Deer and the Antelope, it thus more readily permits of the expansion of the tubular structures in the ruttingseason.

The sigmoid flexure of the penis (P.) occurs rather behind the middle or the organ. There are two strong band-shaped retractores penis (R.p) fixed in front of the bend; but delicate fibres are carried beyond, as a membranous-looking sheath. The præputium (p) is attached by a frænum 2 inches behind the point of the penis. The attenuated glans has an inferior oblique papillar extension of the corpus spongiosum (c. s.), which terminates in a minute orifice, the meatus urinarius.

Combined bulbo-cavernosus muscles (B. c.) produce a swelling almost as large as a chestnut. Each ischio-cavernosus (I. c.) is large and fleshy. The continuous thickish layer of the circular and oblique muscular fibres of the constrictor urethræ (C. u.), $2\frac{1}{2}$ inches long, form a powerful sphincter.

Two Cowper's glands (C. gl.), each as big as a bean, but pedicillate, are situated on the rectal side of the urethra, and immediately behind the root of the bulb. They are yellow-coloured, moderately firm, and separated from each other by fatty and fibrous tissues.

The vasa deferentia $(v. d^*.)$ at the upper end of the neck of the bladder approximate, enlarge considerably, and form a thick, smooth, flattened, elongate mass, which fills the superior fissure between a pair of large glands. These glands, as I have noticed in the anatomy of the Prongbuck, may either represent prostate, vesiculæ seminales, or both. Considered as the homologue of a bifid prostate (P. gl.), they each are 1.2 inch long, 7 inch deep, and together have a breadth of 0.8 in front, and 1.2 inches behind. In side view they are kidney-shaped, with an inferior mesial indentation. From above, including the enlargement of the vasa deferentia, they are somewhat quadrate, narrowing slightly in front. Their surface is smoothish, with the exception of the indentation above spoken of. A nipple-like process from the vasa deferentia pierces the compressor urethræ behind; and the combined secretion of the testes and prostate enters the urethra by a double orifice; ejaculatory ducts (e.d.)behind the middle of the membranous portion of the urethra.

The kidneys agree with the characters assigned them by Pallas, namely, subglobularly oval, a shallow hilus, and unsymmetrically placed in the loins. As he observes, the right one lies near the last rib, whereas the left one is much nearer the ilium. Both, in the male Saiga, were enveloped in a large mass of suety fat. They are smooth-surfaced, without lobulations. The cortical substance is unusually thick; and the single deepish sinus has some half dozen undefined pyramids and infundibula. In the male each kidney measured 2.8 inches long and 1.6 across.

Pallas notes that the suprarenal bodies are oblong or oval, green-

1870.]

ish-yellow, the right placed on the summit of the kidney, the left nearer the hilus. In one specimen only could I dissect them satisfactorily; and in this they were slightly separate from the kidneys.

3. The Alimentary Canal and Accessory Glands.

The œsophagus, 15 inches long in the female and $22\frac{1}{2}$ in the male, has its cardiac orifice opening into the paunch, as obtains in most ruminants; though *Hyomoschus*^{*} and *Tragulus*[†] offer exceptions in its directly communicating with the reticulum. Pallas has figured the four-fold stomach of *Saiga tartarica*, and beside it has placed for comparison that of the *Antilope gutturosa*. His description of the former agrees in most particulars with what I have found, though, as might be predicted, his rigid measurements do not quite accord with my different-aged specimens.

I may reiterate that the paunch is capacious, and bifid at its greater curvature, the reticulum of moderate size, the psalterium is comparatively small, and the abomasus of fair dimensions.

It may further be noted that the cuticular papillary villi of the paunch are short and club-shaped. The cells of the reticulum are of moderate depth, with rudiments of stellate septa within. The folds of the psalterium correspond with Pallas's description, as do the plications of the abomasus.

The same authority mentions that in the abomasus there are often found woolly balls incrusted by a blackish tartar, as in the Sheep. But no such foreign substance was present in the digestive cavity of the Society's two specimens.

In our Proceedings for 1865, p. 262, Dr. Edwards Crisp makes the following statement:—" I supposed, until recently, that only the Camelidæ had water-cavities in the stomachs; but on dissecting an Antelope from Siberia, the Saiga (*Antilope saiga*), I was surprised to find two large water-bags in the rumen." Unfortunately my eye did not catch this paragraph until I had thrown away the said portion of the viscera of both animals. But I avow that I cut up in each Saiga the stomachs throughout their entire course, and aver that neither my assistant, who was present, nor myself detected such a structure. Pallas, whose opportunities were numerous, and who carefully describes the interior of each cavity of the stomach, does not allude to any such remarkable disposition of the parts.

Having great faith in Dr. Crisp as a careful and conscientious observer, I felt it but justice to communicate with him previously to reading this paper. He has been kind enough to reply to me, and as respects the above says, "I cannot find the paper of the dissection of the Antelope, nor can I lay hands on the dry preparation of what I supposed to be water-bags in the paunch; but I give you the size on the other side [alluding to a sketch enclosed]. These may be abnormal from a lesion, or some other cause; and if it is the

* Flower, P.Z.S. 1867, p. 957, & fig. 2.

† 'Sur la famille des Chevrotains,' Monograph by M. Alphonse Milne-Edwards: Paris, 1864. Saiga, and you have found no such protuberances, such is probably the explanation. However, I am not quite sure as to the species of Antelope : I think Mr. Bartlett had some doubt about it."

In the well-conditioned male, as in Pallas's specimen, the mesentery was loaded with fat, which in great part covered the stomach and the convolutions of the gut.

As regards the extent of the intestinal tube, it is best expressed in the subjoined tabular view.

	Zooi, Soc. specimens.												
	,	Pallas's ð							3 spec.	J			
			ft.	in.					ft.	in.	ft.	in.	
Small intestine	in the	Ŷ	33	2	••	\mathbf{in}	the	δ	37	7	39	10	
Cæcum													
Great intestine	23	2 2	15	4	• •		"	,,	17	$11\frac{1}{2}$	16	5	

The lesser gut is throughout narrow. There is no ileo-colic sacculated gland as in the Giraffe; but the ileo-cæcal orifice has a broadish valvular fringe. The cæcum is simple, and neither it nor the colon is provided with longitudinal fibrous bands. Close upon two and a half feet of the cæcal appendage and the great intestine have a diameter of about a couple of inches; the remainder of the tube is of moderate calibre, with a very slight widening towards the rectum. The intestines describe gyrations and are spirally coiled.

My admeasurement of the intestines do not accurately coincide with those of Pallas; but this may be accounted for by variation in the animals' ages, or, mayhap, by reason of one being wild, the other confined and fed differently. Assuming that his observations and those of Cuvier * are correct, the intestinal tract is nearly equivalent to similar-sized Antelopes' and disagrees with that of the Sheep.

Entire intestine exceeds the body in length:-13¹ times, Stag; 13⁶, Saiga; 14⁹, A. cervicapra; 15⁰, A. gutturosa; 28¹, Sheep. The small intestine is in excess of the great:- 1⁴ times, Stag; 2³, A. gutturosa; 2⁶, Saiga; 2⁷, A. cervicapra; 3³, Sheep.

The Sheep-like liver is transversely broad, almost destitute of incisions; what answers therefore to a large left lobe is medianly imperfectly defined. The slight median notch and its round ligament are close to the fundus of the gall-bladder, thus cutting off from its due share of the anterior border the homologue of the lobus quadratus; the latter is moderately wide and triangular. The bayonet-figured caudate lobe is four inches long, and extends freely beyond the right border. A lobus Spigelii is but scantily developed. The relative diameters of the liver in the male Saiga were 10 inches transversely and 6 antero-posteriorly, in the younger female 8 and $4\frac{1}{2}$ inches respectively. As in the Bovidæ, the hepatic substance is soft, finely granular, and smooth-surfaced.

The short roundish gall-bladder is of moderate dimensions, its fossa small and shallow; the fundus, as in *Bison americanus*, reaches quite beyond the free border of the liver. The cystic duct and

* As given by Meckel, Anat. Comp. vol. viii. p. 446. Meckel's estimate does not correspond with the above data calculated from his table.

1870.]

ductus communis choledochus are both narrow, and together over 3 inches long. The latter opens slit-wise into the duodenum, 7 inches (Pallas notes 10) distant from the pyloric orifice.

The pancreas and mesenteric glands present nothing worthy of notice.

4. The Mouth and Organs of Deglutition.

In the 'Spicilegia' quoted, the hairy upper lip, premaxillary pad, conical papillary fuscous buccal region, and livid tongue are briefly mentioned. I may add, however, a few remarks. There are a dozen forwardly convex linear and fringed transverse palatal elevations; behind these the surface is smooth and somewhat concave from the second molar backwards.

The dark coloration of the tongue is limited to its anterior half or that portion capable of being extended; the posterior moiety, on the contrary is very pale-coloured. In the male the gustatory organ was 6 inches long, and within a trifle of $1\frac{1}{2}$ inch broad at root. In general appearance it is uncommonly like that of a Sheep, much more so than to an Antilope's tongue. The root is thick and convex, the middle considerably narrower; and forwards from this it by degrees widens into a broad flat spatulate extremity. The tip is slightly notched in the median line; and from this a shallow furrow runs back for $1\frac{1}{2}$ inch. Below there is also a very shallow medial furrow $\frac{1}{2}$ inch in length. From the frænum linguæ the tongue is free for $1\frac{1}{2}$ inch. Between the tip and the anterior portion of the dorsum the surface is comparatively smooth, the filiform papillæ being very short, close, adpressed, and towards the posterior portion retroverted. Each lateral margin of the dark portion of the tongue, and an arch $\frac{1}{2}$ an inch deep underneath the tip, are beset with punctiform flat-topped papillæ fungiformes. The conical papillæ on the white convex dorsum are of moderate size, and, as in the Sheep, form a longitudinal ellipse. The papillæ circumvallatæ are few in number, of small size, and sparsely scattered in parallel longitudinal rows on the external surface of each side of the dorsum and root.

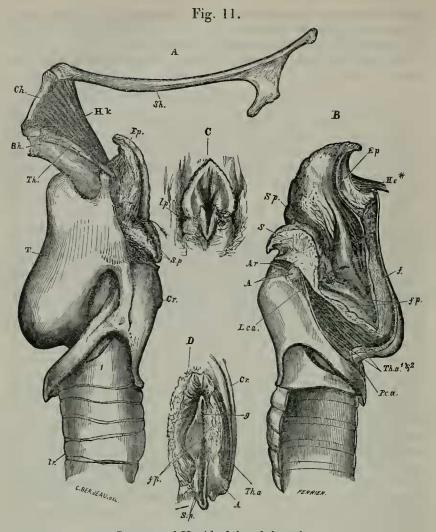
The Saiga being a delicate feeder, choosing, like the Goat, aromatic herbs, may account, physiologically, for vast numbers of gustatory papillæ found at the sides and under surface of the tip of the tongue.

The velum pendulum palati is a thick and deep fold, narrowing cousiderably the passage into the pharynx. The arch above is dense and muscular; but the free margin is much thinner and membranous. The two small follicular tonsillary glands are hidden within the pillars of the fauces; and open into the palatine arch by a narrow orifice in front of the epiglottis. The mucous membrane around the fauces is smooth.

The pharynx is a much wider cavity, and is abundantly supplied with submucous glands: its constrictor muscles have but moderate thickness.

Of the glands conveying their secretions by ducts into the mouth,

489



Larynx and Hyoid of the adult male.

- A. Profile view of the outside. T. Thyroid ala, showing its inferior gibbosity. Cr. Cricoid cartilage. tr. Trachea,—1 marking its first, broader ring. Ep. Epiglottis. S. p. Projections over cartilages of Santorini; the arrow above indicates the upper laryngeal aperture. Sh. Stylohyal. Ch. Ceratohyal. Bh. Basihyal. Th. Thyrohyal. Hk. Hyo-keratic muscle.
- B. Larynx dissected, the side of the thyroid cartilage and tracheal rings removed. Ep. Cartilage of epiglottis. Hex. Portion of the hyo-epiglottic muscle. f. Fat, and f. p. fatty projections on sides of glottis; the arrow points to aperture of the last. Th. a. 1 & 2. Lower and upper thyro-arytenoidean muscles. P. c. a. Part of the posterior cricoarytenoideus. L. c. a. Lateral crico-arytenoideus. Ar. Arytenoideus muscle, and A. artytenoid cartilage. S. Cartilage of Santorini. S p. Projection of Santorinian cartilage and fatty tissue.
- C. Pharyngeal view, epiglottis and superior aperture of larynx. *l.p.* Exterior laryngeal poneh.
- D. Partial dissection, displaying from above the false vocal cords and chink. Cr. Segment of the cricoid. A. Upper view of arytenoid cartilage. S. p. Projections of eartilage of Santorini on one side, and fatty covering on opposite moiety. f. p. Anterior fatty prominences bounding (g) fissure of the glottis; the tissue on the left side has been eut off.

the parotid (fig. 8, P. gl.) needs be mentioned, as of very large size, wide, flat, and coarse in texture, as, indeed, is the case throughout the larger Bovidæ. Stenon's duct (St.d.) is capacious and long, curves round the mandibular angle in company with the facial vein (F.v.), dips into the cheek-tissnes, and finally opens by a papillary orifice close behind the angle of the mouth. In the Common Goat Stenon's duct opens much further back in the mouth. There is a small flat glandular mass (fig. 8, Gl. s), spread thinly upon the surface of the buccinator muscle, and entirely separate from the parotid, though in connexion with the Stenon's duct. This buccal gland may be the homologue of the so-called socia parotidis in Man, here thrown considerably forward, and quite isolated from the parotid itself. The submaxillary gland appears closely commingled with the parotid. The sublingual gland is well developed, lies in the usual situation alongside the tongue, and is very elongate, corresponding with the shape of the latter organ.

The large dimensions of each and all of these salivary apparatus is not peculiar to the Saiga; for, as is well known, in the whole of the ruminants it attains considerable volume.

5. Vocal and Respiratory Tract.

When the pharyngeal wall is cut through and reflected, the upper laryngeal parts present the following aspect (vide C, fig. 11) :- The aryteno-epiglottic folds are large, and lie outwards, giving breadth to the deeply excavated laryngeal opening. The glottis is an elongate arrow-headed fissure, wide in front and narrowed behind. The posterior floor or basal end of epiglottis has two parallel longitudinal narrow ridges, which descend towards the rimal aperture. Outside the aryteno-epiglottic folds and between them and the thyroid cartilaginous alæ are deep and wide cavities (exterior laryngeal pouch, l. p), the posterior ends of which curve inwards. Bounding the narrowed hinder end of the glottis are two long narrow membranofatty projections, which unite behind and thus form a compressed V-figure ; these (lettered s. p, in cuts A, B, D, fig. 11) are eminences produced by thickened tissues surmounting the upper border of the cartilagiuous plates of Santorini, or, possibly, combined with these cuneiform cartilages. With its side folds, the epiglottis looks full, is somewhat triangular in outline, and less than an inch in its diameters.

A deeper dissection of the upper laryngeal cavity, as in the side view B and upper view D, shows that this is capacious, and that the walls, both laterally and in front, are padded with fatty matter (f). This, with its mucous lining, forms numerous thick longitudinal folds; and quite in front is a sulcus, which, descending, leads into a small pouched cavity within the depending globosity of the thyroid cartilage. This recess, hidden by the folds spoken of, is slightly locular or gland-pitted within. The chink of the glottis (g), commencing immediately behind this pouch, has an antero-posterior diameter of 2 inches. Its anterior half is bounded by two considerable-sized ploughshare-shaped fatty projections (f. p) meeting in front. External to each fatty mass there is a deep furrow which tends forwards to the anterior thyroid saculus. The posterior half of the laryngeal aperture is walled by the Santorian cartilages (S)and adipose coverings (s. p), the aryteniod cartilages flanking these.

There are no lateral sinuses or ventricles other than those described.

The adjoining lips of the rima glottidis forming the true vocal cords are continued down from the fatty eminences for the depth of an inch, and are set at an oblique angle, parallel with, but above the anterior ring of the cricoid. They are smooth-surfaced, and, in the relaxed condition of the parts, approximate, leaving but a narrow fissure. The aperture behind them, at the arytenoid and Santorini cartilages, is a trifle wider; and from these the inferior cavity of the larynx descends as a funnel between the vocal cords, the posterior cricoid shield, and the expanded hinder arch of the uppermost tracheal ring, to the large tracheal passage itself. Thus, as in *Hyomoschus**, there is a partially cylindro-tubular passage behind, more or less divided by the thrust-forward vocal cords from the anterior or upper thyroid chamber.

Cleared of superincumbent tissues, the thyroid cartilage (T) exhibits two thin but broad and long lamellar alæ, and, besides, a median and very remarkable enlarged gibbosity. This salient inflation inclines towards, but does not reach, the anterior cricoid arch. The thyro- and crico-hyoid muscles do not cover it, the inner border of the former filling a shallow valley on either side. There is a shallow median notch at the anterior border of the cartilage.

Each anterior cornu is about $\frac{1}{2}$ inch long, moderately narrow, and composed of thin translucent fibro-cartilage. The posterior cornua are much stouter and twice the length of the preceding. The upper and lower cornual appendages are situated in a line with each other, though widely apart, and directed contrariwise. At their inner roots the thyroid border is widely emarginate, the lower deeply so, through which passes the cricoid ring and crico-thyroid muscle. The entire surface of the thyroid cartilage is smooth and with no defined oblique line. In extreme length it is $2\frac{1}{2}$ inches, and its greatest diameter 1.8 inch.

The cricoid (C) is much the stronger cartilage. Its posterior surface is carinate, the broad upper border being transversly arched and free from incision; the lower border is thin and terminates in a spatular cartilage. The anterior segment of the cricoid ring descends obliquely from opposite the postthyroid cornu. At first broadish, and then gradually narrowing, it meets its fellow of the opposite side in the form of an inverted gothic arch, which, expanding, overlaps the first and partly the second tracheal rings. The postero-cricoid shield is 2-1 inches long, and $1\frac{1}{2}$ inch broad, and each moiety of the anterior ring is a couple of inches in length.

Each arytenoid cartilage (A) is about 1 inch long, and, attached by a joint to the upper and outer angle of the cricoid shield, passes * Flower. P. Z. S. 1867, p. 957. 1870.]

therefrom in an oblique line cutting the said point and the thyroid gibbosity. It has an irregular elongate triangular figure, $\frac{1}{2}$ inch broad behind and narrow in front. Its borders and surfaces are more or less concave; and the cartilage altogether is stout, thick, and from 0.3 inch deep behind lessens considerably forwards. At the external cricoid joint there is a considerable-sized nodosity; and the inner superior margin is crescentically ridged and overtopped by the cartilage of Santorini.

The latter (S) is a thin falcate lamella of soft yellow fibro-cartilage, some 0.8 inch long, and above 0.3 inch in extreme depth. It forms a crest, as said, to the arytenoid, and is itself covered by a fatty layer, producing those posterior elevations of the postlaryngeal aperture (s. p) already dilated on. It may be that these include the cartilages of Wrisberg, which otherwise are wanting.

The cartilage of the epiglottis has a consistence like the last, is of obcordate shape when cleaned of investing membrane, and has a retroverted broader tip than in the Prongbuck.

As regards the structure of the Saiga's larynx, it may be regarded as an intermediate type between the Sheep's and that of some Antelopes and Deer. In Ovis we have a rudimentary condition or tendency of the thyroid cartilage to inferior enlargement. This becomes more marked in such forms as the Gazella dorcas, G. ruffrons, and Tarandus rangifer, as Meckel* has noted. In Hyomoschus aquaticus this protuberance is increased in dimensions, as Flower + figures, but is not, as he supposes, peculiar to this Ruminant; for, as long ago demonstrated by Pallas, the Antilope gutturosa[†] is notorious and specifically named on account of its great thyroid development, which is said, indeed, to produce quite a gular swelling. As figured, this thyroid inflation is several inches in diameter. The single thyroid sacculus contained within, doubtless coexists in these latter forms, as in Saiga, thus differing from several of the Pachyderms' and other types, where there are a pair of lateral sacculi. In the Horse, however, there is a similar recess at the base of the epiglottis.

Concerning the voice of the Saiga, if this be studied not purely physiologically, but as a sign indicating affiliation of stock, it is of some interest. The tone and manner of utterance is remarkably like that of a Sheep, to wit, a single full bleat or bay, the shrill treble note of Goats and most Antelopes being markedly varied from that of the above genera. The Deer generally have a more grunting tone, though extensively modified in different genera, as, indeed, also obtains in the Antelope section.

Of the muscles connected with the larynx and its bony arch, the sterno-hyoid and sterno-thyroid, long and fleshy, are united opposite the posterior end of the thyroid gland on the fourth cartilaginous ring of the trachea: here they separate; the former continues in the middle line to the os hyoides, whilst the narrower sterno-thyroid diverges slightly outwards, and is inserted by a short broad tendon into the outer posterior margin of the thyroid cartilage. The crico-

* Anat. Comp. vol. x. p. 604.

† Loc. cit. p. 955.

‡ Spic. Zool. tab. iii. fig. 16.

PROC. ZOOL. SOC.-1870, No. XXXIII.

[June 9,

hyoid has the usual attachments, but is very broad, and obliquely directed inwards and downwards or backwards.

The thyro-hyoid is a remarkably long, broad, and thin sheet of muscular fibres: origin, sides of thyroid alæ, exterior to the salient protuberance; insertion, the whole of the basihyal and the thyro-hyal cartilaginous rods. A broad portion of the median constrictor passes on to the thyroid ala beneath it. The stylo-hyoid, fleshy and strong, pierced by the median tendon of the digastric muscle, is inserted broadly into the basihyal. I may note also the presence of a large triangular fleshy muscle, the so-called hyo-keratic of some authors (Hk).

The crico-thyroid is notable by the obliquity of its fleshy fibres. These meet in the median line, are attached to the upper border of the cricoid in front, but laterally cover it; ascending backwards, the fibres are inserted into the cricoid margin of the thyroid ala. The posterior crico-arytenoidei (P. c. a) are large but thin, and fit the shallow concavity of the cricoid shield. Owing to the oblique downward position assumed by the anterior cricoid ring, only short narrow wedged-shaped fasciculi of muscle represent the lateral cricoarytenoidei (L. c. a). Each arytenoideus muscle (Ar) is fairly developed, and, as usual, fills the post-concavity of the arytenoid cartilage. The thyro-arytenoidei (Th. a & Th. a. 1 & 2) are great soft muscular bands imbedded amongst and partially interwoven with fatty tissue. They take origin within the cavity of the thyroid prominence, and, proceeding backwards and upwards, partly covered by the cricoid and thyroid alæ, are inserted into the root and outer margin of the arytenoid cartilage.

The bones composing the complex hyoid arch are each relatively long; but there does not seem to be present such a very elongate fibro-cartilaginous styloid cord as is figured by Pallas in the male Antilope gutturosa. In the Saiga, as in it and the Sheep, the basi-(Bh) and thyro-hyals (Th) thoroughly interblend together and constitute a high arch, from the summit of which three short blunt processes spring. The middle one, the strongest and most projecting, is the rostrum of the basihval; the outer ones, or wing expansions of the bone, give lateral breadth rather than branch forwards. From these the styloform thyro-hyals retrograde. The basihyal is just under 1 inch broad, and each thyro-hyal $1\frac{1}{2}$ inch long. The latter were cartilaginons, the former semiossified in the Society's male specimen. The cerato-hyals (Ch) have a free articular surface The epihyals nearly correspond, though, unfortuat each end. nately, not defined or lettered in A, fig. 11. They each are less than an inch long, their ends swollen and body laterally compressed. The stylo-hyal (Sh) is fully 3 inches in length, the body slender, but the cranial end expanded into a flat somewhat rhomboidal figure. The upper spur terminates in a small tympanic bulb; the lower spur broadly descends, and, with concave antero-posterior margins, bends forwards in a spine.

Comparing the hyoid of Saiga with the Sheep's, it is altogether more delicate, and each bone longer. The spurs of the cranial end of the stylo-hyal are much shorter and stouter in the Sheep. The Antelopes conform more with *Saiga* in the contour and slenderness of their hyoidean elements, and more so than do the generality of the Deer.



Head of the male Saiga in its winter coat. From a drawing made under the author's supervision while the animal was living in the Gardens*.

The trachea, as noted by Pallas, is large. The cartilaginous rings, forty-nine in number, are wide, and do not meet behind, the fibrous

* I am indebted to Mr. Glass, the editor of 'Land and Water,' for the use of this woodblock. Remarks on the animal, by Mr. Blyth, will be found in that publication for 14th December, 1867.

June 9,

interval being broad. Several of the uppermost rings interdigitate. In front the first one corresponds in width to the succeeding rings, but laterally and behind it expands in a broad triangular form, the anterior or upper margin of which fits into the lower arched border of the cricoid cartilage.

The lungs agree with Pallas's description, the left trilobuled, the right tripartite above, and a large lobe below, with a partial lobule at its upper and inner corner.

IV. EXTERIOR CHARACTERISTICS.

1. Form and Integument.

Without hesitancy I offer testimony to the unusually lucid and succinct manner in which Pallas sets forth his descriptive remarks of the external characters of the *Antilope saiga*; and his illustration of the animal is equally happy. Wolf's coloured lithograph in our 'Proceedings,' 1867, pl. xvii., depicts the species in a different seasonal dress; and consequently the neck has a thicker aspect than in the former author's figure.

It is in the hornless female that one quickly traces Sheep-resemblances, the addition of the erect annulated horns in the male masking or altering the ovine expression. Seen from above, the hornless head is long, and, indeed, rather Pig-like, the ears standing well out, the jaws tapering but slightly towards the broad truncated nostrils. The capacious, patulous, oval nasal apertures are a most remarkable feature in the front view when the head is raised. In the adult male (fig. 12) the prolongation of the nasal trunk is greatest, and there is a thick tuft of long hair springing from beneath the eye and overhanging the cheek, besides a fringe of long hair at the margins of the ear, which heightens the uncouth aspect of the animal.

As regards bodily dimensions, these have been amply given in the table (p. 37) of the 'Spicilegia.' From my measurements of the dead bodies it appeared the adult male stood higher at the withers than at the loins, the reverse being the case in the half-grown female.

A circumstance is mentioned by Pallas which merits attention as affording an inkling of affinity. I allude to the fact that the horns of the Saiga are subject to inconstant abnormalities as regards number. He says (l. c. p. 35), "Certis testimoniis consentientium venatorum, quos veraces alias expertus sum, plurium teneo, reperiri interdum succenturiato ad alterum latus minori cornu tricornes mares; reperiri æque raro unicornes, cornu majori, monstroso varieque torto in media fronte instructos."

Among the Deer it is no uncommon thing to find irregularities or abnormalities in the growth of the horns—for instance, in the production of extra snags or non-development of the normal ones. No Deer, however, to my knowledge, possesses more than two branched antlers or cervine horns proper; nor do I know of any case where excess of this number has occurred as a malformation. The fossil forms, *Sivatherium giganteum* and others, it is true, may be cited as an exception, as it unquestionably hore two postfrontal palmated antlers, likewise two infrafrontal or supraorbital horns with cores.

Again, among the Antelopes the genus *Tetracerus* is the only living representative normally carrying four well-pronounced and separate hollow horns. But neither in *Tetracerus* nor *Sivatherium* do the two supernumerary horns occupy the position assigned by Pallas to the extra ones of *Saiga*. With the limitation above mentioned the Antilopine, like the Cervine, group present no examples deviating from the common rule of two horns.

It is, I believe, alone the Ovine family of the *Bovidæ* which are subject to great variation as respects the number of horns; and hence among sheep one, two, or as many as six postfrontal horns are not unfrequently met with. Nay, more, there are well-defined breeds of four-horned Sheep wherein two horns are erect and not unlike those of *Saiga*, mayhap less annulated; whilst the second pair are broader, flat, and down and inwardly curved. In this respect, therefore, and in the semitransparency of the corneous texture, *Saiga tartarica* gives indications of family relationship rather with Sheep than with Deer, Antelopes, Goats, or Oxen,

Concerning the structure of the core supporting the horns, this, on being cut into sections, longitudinal, transverse, and tangential, was found to consist of osseous substance neither very cellular nor very solid*. Interiorly throughout almost the entire length of the core were minute parallel and partially interweaving tubuli or pores. These were of greatest diameter towards the base; but it was not ascertained whether they communicated with the frontal sinuses, though from appearances I presume they did so. The external and more solid part of the core is finely grooved.

Between the bony horn-core of Antelopes, Sheep, and Goats, that of Saiga may be placed as intermediate, though as regards textural fineness it agrees most with the first mentioned. Colonel Smith's opinion, endorsed by Dr. Gray and opposed to that of M. Geoffroy St.-Hilaire, Cuvier, Latreille, and others, is that Antilope, Capra, and Ovis assimilate as regards core horn-structure, but differ from the Bovidæ in the cancellated tissue being of a closer consistence.

The nature of the hairy coat and the manner in which it is annually shed are pertinent as regards affinities.

First, it is well known the animal assumes a summer and a winter fleece; that is to say, a periodical shedding takes place. Now this changing of the Saiga's coat occurs differently from what is witnessed in Deer and Antelopes, where replacement proceeds hair by hair, so that no sudden alteration is observed. In Sheep, as is notori-

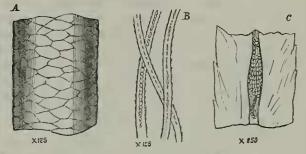
^{*} The animals examined by me having been disposed of for skeletons, I had no permission to cut into their horns or skull; but through the kindness of Mr. Bartlett an odd horn in his possession was put at my disposal, and sliced as above stated.

[June 9,

ously the case, the fleece annually is pushed off *en masse*, or in great patches, by a more or less uniform fresh growth beneath, and at such times the alteration of appearance is very marked. The Ovine fashion is that which *S. tartarica* follows.

Secondly, the hair of the Saiga has the inherent quality of felting. This property, opposed to its comparative absence in Antilopidæ and Cervidæ, is conspicuously prominent in the whole of the Ovidæ. The tenuous underwool (fig. 13, B, C) which works out in flat masses, weaving and binding together the coarser fibres (the process of felt), is not so fine and delicate as in some ruminants, e. g. the Prongbuck; but its cohesive wool-properties are undoubted.





Microscopical structure of the Hair and Wool of the Saiga.

- A. Portion of a hair-shaft, showing the large cellular medulla and thin cortical layer.
- B. Magnified view of wool; and
- C. Portion of the same under a higher power, displaying the central cavity and pith-cells.

Thirdly, very critical evidence of the consanguinity of Saiga to Ovis is shown in the microscopic constitution of the hair. Indeed in this respect it would appear to have affinities or leanings more towards the Cervine than the Antelope type. The finer filaments, or wool sui generis, need no further mention ; but the thicker brittle fibres, or true hair, have relatively and absolutely a very thiu cortex, whilst the medulla is composed of unusually large cells, somewhat hexagonal in contour, though with evident tendency to a transverse wide ellipse (fig. 13 A). These characters cling to the hair of all Sheep, and gradate towards the rather smaller-sized, many-sided, cellular structure of the Deer's hair. In the Antelope group, A. cervicapra, for example, the cortex is much thicker, the cells extremely small and so compressed that under low powers they seem as if but transverse striæ. The hair of the mountain-loving Chamois, however, is well nigh identical with that of Saiga. The Goats have hair which may be said to stand midway between the Antelope's and Deer's, inasmuch as the cells are of diminished size, oval, but considerably compressed in the long direction of the hair; the cortical layer, moreover, is dense.

Amongst habits peculiar to the Saiga, and which in some senses

498

appertain to the external characters of the animal, are its modes of progression, defence, and attack. As Mr. A. D. Bartlett and myself have noted, its walk is sedate and steady; but when frightened or pursued, it alters its step and springs with a series of bounds in a vaulting manner. This movement is very different from that of Deer or Antelopes (except in few instances), which trot or canter, two feet touching the ground at the same time, according to the pace adopted ; whereas, like mountain-Sheep or Goats, the Saiga jumps elastically, all fours leaving the ground at once. The ischiatic nerves of the last are of immense calibre; but whether this might be adduced as a physiological evidence of the above habit I will not pretend to say.

Pallas appears to think that the ample larynx and respiratory organs sufficiently account for their great swiftness, and quotes Cook * in proof of their speed. The latter says they are the finest runners he ever beheld, at first outstripping a greyhound, though not holding out so long: their feet seem scarcely to touch the ground.

When Deer fight they run against each other forcibly or tilt their horns in a scooping manner. Antelopes use their horns, or charge with a jerking movement of the head. Goats rear and strike downwards. Cattle toss, gore, or bruise with their head. The clashing butt of Sheep is notorious, as any one is cognizant of when two rams fight. They rush backwards, and by a run gain impetus, and smash head onwards with fearful violence. I have myself witnessed more than once an animal killed outright by the shock. The Saiga, as far as the above habits are concerned, is a true Sheep, and not at all an Antelope.

2. Cutaneous Glands.

It is well known that the Ruminantia possess cutaneous secretory structures in various parts of their body. The most obvious of these are the suborbital glands. Another series, either found on two or on all four feet, are the interdigital sacs; whilst yet others, of more inconstant presence and significance, are found in the dermal substance of the groin, on the tarsal segment of the limbs, or on the back of the head and rump. This subject has received attention from Jacob +, Owen ‡, Colonel Hamilton Smith §, Hodgson ||, and others; but the most critical digest is to be found in the masterly Essay of the Society's late and learned Secretary Mr. William Ogilby ¶.

In both the male and female specimens of Saiga tartarica examined by me I have found, with a partial variation of the con-

^{*} Voyages and Travels through the Russian Empire (Edinb. 1770), p. 317.

^{*} Rep. Brit. Assoc. 1834.
* P. Z. S. 1836, p. 37.
§ Griffiths's Transl. 'Regne Animal.'
* Journ. Asiat. Soc. Bengal, 1832, and P. Z. S. 1834, p. 80.

[&]quot; "Monograph of the hollow-horned Ruminauts," Trans. Zool. Soc. vol. iii. p. 33.

dition of the inguinal integument, the same subcutaneous glandular apparatus extant. A single description, therefore, will suffice for both. Pallas, it may be remarked, has partially indicated what I shall describe more in detail.

1. There are two small suborbital glandular sacs, the so-called crumen, lachrymal sinus, or tearpit of some authors, which yield a thick whitish or pale-yellow exudation. These are situated in front of the orbit, and slightly below the median transverse line of the eye. In the younger female the small external openings of these were placed $\frac{3}{4}$ of an inch, and in the male $1\frac{1}{2}$ inch, in advance of the orbital ring; but the sinuses or sacs themselves lay in the broadish and moderately excavated infraorbital fossæ.

2. Each foot, as in the Sheep, possesses an interdigital sac about $1\frac{1}{2}$ inch in depth, and opening by a narrow constricted aperture at its front and upper part. The orifice is hidden by very short closely placed yellowish hairs, whilst below these the sac is superficially covered by a tuft of much stronger and longer hairs. The secretion derived from these interdigital bags is yellow and of a hardish ceruminous character.

3. On the anterior aspect, but slightly to the inner side, of each fore knee is a small dermal gland, or a thickening of the cutaneous tissues, covered by a brownish patch of firm hairs.

4. In the inguinal regions of both sexes bare oblong or lozengeshaped spaces exist; each of these is 5 inches or more in extreme long diameter. Upon their inner edges in the female the imperfectly developed udders and four teats are situated. There are no pouches or sacculations in the anterior part of these bare spaces, as obtains in *Cephalophus dorsalis* and some other forms, the skin in the Saiga being dry and nearly void of cuticular secretion; but at the postinguinal extremities in both sexes of the latter animal there are glandular pores. In the male there is a very marked crescentic skin-fold $\frac{3}{4}$ inch long and about $\frac{1}{4}$ inch deep; and this interiorly contains abundance of minute pore-like glands and a free secretion. The odour of the secretion is faint and ceruminous.

The same portion of the postinguinal space in the young female differed from the male in there being no tegumentary sac or induplication of the tissues; but a smooth-surfaced secretory apparatus was present, and from this a moist waxy substance exuded.

From what has been detailed above it follows that the true aggregated cutaneous glands of the Saiga Antelope altogether are ten in number.

Upon my carefully dissecting and reflecting the skin of the groin beneath these postinguinal pouches or folds, I was surprised to find that they each possessed a retractor-like muscle. This was a small flat narrow fleshy band inserted on the middle of the duplicature of the skin; from this it ran outwards across the posterior end of the abdominal muscles, and appeared to arise beyond the general opening on the surface of the iliacus and between it and the fibrous expansion of the external oblique muscle.

The use of this well-defined muscular slip is to draw inwards and

sacculate the glandular portion of the skin of the groin. I am not at present clear regarding its homology; but the better to call attention to the existence of this muscle, I propose temporarily to denominate it the *invaginator sacculi*.

V. SYSTEMATIC POSITION OF THE SAIGA TARTARICA.

When what is regarded among zoologists as an exceptional form, either in a family or genus, is put to the crucial test of anatomical detail, it is oftentimes hard to assign the creature a definite place, even when in possession of the more complete data. Such an animal is the Saiga!

The difficulty in this as in similar cases springs mainly from two causes. One is the value to be attached to any single character or set of characters; for upon this point the most conflicting views are entertained equally among the younger school of naturalists and among the older authorities.

The other cause arises out of the circumstance that in most species such as that under consideration we have what the indefatigable embryologist Parker very deftly expresses in birds as "a generalized form," moulded akin to no special group, but, as it were, a combined patchwork of varied structural organization.

The characters assigned by Pallas (l. c. p. 14) in his analysis of the genus Antilope * are, "Ant. saiga (cornibus distantibus, lyratis, pallido diaphanis, naso cartilagineo ventricoso)."

Setting aside older and subsequent authors, I may mention that Dr. Gray +, with the addition to the above definition of its crumen (suborbital gland), distinct and soft fur, generically subdivided Saiga tartarica among the "Antelopes of the Fields" in his synopsis of the Bovidae. Mr. Turner ‡, in grouping the hollowhorned Ruminants from a study of their crania, unfortunately did not see a skull of Saiga. Provisionally, from the shape of the horns, that able anatomist placed it under Gazella, though animadverting upon Gray's generic separation because of their pale colour. The reply of the latter (Cat. B. M. 1852, p. 51) sufficiently answers the objection. This translucency of the horns, moreover, has even greater significance than their lyrate, annulated character, and, together with their occasional multiple number, decidedly evinces affinities to the Ovine type. Doubtless in size, shape, and position they conform to the Gazelles. So far, therefore, as outward aspect is concerned, they belong to the Antelope section, but not necessarily so; for in the four-horned breeds of Sheep, and even in some of the two-horned varieties (e.g. the Wallachian Ram), these organs to a certain extent assume the said peculiarities.

When the skeleton comes to be considered, the skull, as rightly interpreted by Turner in other Bovidae, affords distinctive marks of its family relationships. Whilst exhibiting structural formation pe-

^{*} See Ogilby's critical remarks thereon, Trans. Zool. Soc. vol. iii. p. 38.

[†] Ann. & Mag. Nat. Hist. (1847), vol. xviii. p. 227.

[‡] P.Z.S. 1850, p. 168.

[June 9,

culiarly its own, it, at the same time, as the comparison already entered into has shown, deviates in several characteristics from the genus *Gazella*, as indeed it does from all modern *Antilopidæ*. Still though endowed with a basis of Ovine construction, it sheers off from this group and engrafts itself with the Antelopes. Over and above it reverts to those strange ancient Deer-like forms of the Tertiary epoch, though isolated from the recent Cerfs, not excepting the abnormal-nosed Elk.

The vertebral column is neither strictly that of an Antelope or Sheep, but a mixture of both, with a specialized atloid transverse process. The pelvic arch in the male is nearest allied to that of the Ram, the scapula to the Antelope's. In relative lengths of the limbbones the fore extremities range with *Ovis*, the hind legs with *Cervus*; but in fineness of symmetry they have more a Gazelle aspect.

Skeletally there are shades and grades of various groups of Bovidæ intermixed, truly one of Parker's "generalized forms," so interblending by structural ties of families otherwise removed, that old taxonomic lines of demarcation are resistlessly swept away.

All the habits of Saiga are consistent with those of a Feral Ovis. As to the fleece, taken in all its bearings, it does not belong to the Gazelle group nor Antelope proper, but essentially is a slightly modified species of Sheep's wool. I should say of the interdigital sacs, crumen, and knee-patches, that they, in this case, hardly afford satisfactory grounds to base affinity upon. The remarkable internal nasal or maxillary sinus, besides the nasal enlargement, nevertheless leads on apace to Pachyderms, where, as in the Tapir, such maxillary sacs, elongate cartilages, and modified proboscides obtain. The fact that there is abundant fatty deposition, in the fleshy structures outside the body as well as viscerally, and in the scrotum, is in favour of Ovine affinities; in most Antelopes, and universally among Goats, fat is developed meagrely on the body and omentum, being chiefly found *en masse* surrounding the kidneys.

The relatively elongate heart is that of an Antelope or Deer; and the intestinal length conforms with these rather than Sheep.

The final result of all the evidence which can be gathered from the anatomy of the singular Saiga tartarica leaves still doubts regarding the creature's place in any one of the present groups of the Bovidæ. It cannot be said to be purely an Antelope, though in many particulars it announces alliance with the genus Gazella, among which, however, I must reject its admission. To the Sheep tribe it is even more related in a variety of characters; yet must it be excluded from either of Gray's Ovine genera (Cat. B. M. p. 160) Ovis, Caprovis, Pseudovis, and Ammotragus. Betwixt the above subfamilies or subtribes the Saiga appears to hover, masking under an Antilopine aspect much that belongs to Ovine race. Again relations of no mean kind, whether in a physiological or anatomical point of view, link it with the ancient quadricorn Siva and Titanotheres.

The non-position, so to speak, of the Saiga among present groups having been established, the difficult task of assigning a location and defining systematic characters for it remains; and here the proposition as to the relative value of these is encountered. If horns are the test, the place assigned it by Gray and Turner cannot be objected to. If tried by Ogilby's standard of the form of the upper lip, and distribution of cutaneous glands, or Sundevall's proposed arrangement by hoof-structure, it may claim kindred with several widely different tribes.

If teeth rule, or visceral structure prevail, it is of alien stock. If the skeleton, and specially the skull, decide its position, there is still something equivocal in its kinship.

Thus, what I have said of the Prongbuck is applicable to the Saiga: both constitute forms of intermediate position, and defy the mandate of systematists who rigidly circumscribe the boundaries of groups. They tell in the strongest terms how interblended are the Ruminant tribes and subtribes. Every fresh fossil remnant, moreover, proves the truth of this dictum, and makes even the definition of genera unstable, generic limitation, in the present state of science, being a manifold convenience.

The Saiga, to all intents and purposes, may be regarded as an Antilopine Sheep, not absolutely a Sheep, but an offshoot derivative of the genus *Gazella* rather than of Turner's Ovine Antelopes, *Nemorhædus*.

With this shifting of tribal alliance, Dr. Gray's generic rank to it would remain, with the addition of such anatomical characters as I have enunciated.

Genus SAIGA, Gray.

Horns roundish, lyrate, annulated, translucent. Nose very high and produced, walls soft, cavities capacious, and orifices patulous. An internal maxillary sinus or ponch. Crumen, inguinal, and inter-digital sacs present. Fleece ovine but short. Molars without supplemental lobes; the median incisors only moderately expanded. Nasals and præmaxillæ very short and far apart; a wide vacuity above. Maxillary produced as a shallow rostrum. Lachrymal higher than broad; no naso-lachrymal fissure; a shallow impressed suborbital fossa; masseteric ridge rising before the orbit; basioccipital flat, as wide as long, or slightly more expanded in front; anterior basilar tubercles well developed, the posterior ones less so, but not small; auditory bullæ moderate, partially inflated; a mastoidal or supraparamastoidal concavity; spheno-pterygoids high, approaching the vertical. Horizontal palate-plates reaching far back; posterior nares wide and deep. Limb-bones of moderate length, with Ovine proportions and Antilopine symmetry. Male thyroid cartilage somewhat gibbous, but no internal laryngeal pouch; thyro-hyals long. Intestines Antilopine in their moderate length and proportions. A gall-bladder present. A well-developed prostate and Cowper's glands ; penis terminating by a short whip-like extension of the corpus cavernosum.

10. Synopsis of the *Cracidæ*. By P. L. SCLATER, M.A., Ph.D., F.R.S., and OSBERT SALVIN, M.A., F.L.S., &c.

Sect. I. Introductory Remarks.

In his article on the classification and distribution of the Alectoromorphæ, published in this Society's 'Proceedings' for 1868, Professor Huxley has clearly pointed out the characters which divide the Gallinaceous birds into two divisions, the *Peristeropodes* and the *Alectoropodes*. "In the former division the foot is pigeon-like, the long hallux being on a level with the other toes; while in the latter it is fowl-like, the hallux being short and raised." This difference in the structure of the feet is accompanied by well-marked osteological characters, particularly in the form of the sternum, which Professor Huxley then proceeds to speak of.

The Peristeropodous Gallinæ embrace only two families, the Cracidæ and Megapodidæ—the former peculiar to the tropics of the New World, the latter characteristic of the Australian region of the Old World, whence it extends into the adjacent districts of the Indian region.

Professor Huxley states that he is unable to discover "any important osteological differences whatever" between these two families; and there can be no doubt that as regards the structure of their osseous skeleton they are very intimately allied. But they are exceedingly different in other respects, particularly in their nestinghabits and general mode of life. While the *Megapodidæ* spend their existence on the ground, and lay their numerous eggs in vast mounds raised for the purpose, leaving them to be hatched out by solar heat, or by that arising from the decay of vegetable matter, the *Cracidæ* are essentially arboreal, only occasionally descending to the earth beneath the dense forests in which they dwell. The latter also are true nest-makers, build these structures upon the branches of trees, lay but few eggs, and perform the duties of incubation like orthodox birds.

In continuation of former papers of the same sort upon the birds of the New World, we have now to offer to the Society a revision of the species contained in the last-named family. This has been founded mainly upon the following collections :—(1) the collection of Messrs. Salvin and Godman; (2) that of the British Museum; (3) that of the Smithsonian Institution, which has been most liberally sent over to us from Washington for this purpose; (4 and 5) those of the Museums of Paris and Berlin, which have been examined by Sclater during recent visits to those citics; and (6) the living collection in the Society's gardens, which embraces twenty-six specimens, belonging to sixteen species. We have likewise

1870.] MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ.

received great assistance, in answers to numerous inquiries and in loan of specimeus, from Herr v. Pelzeln, of the Imperial Cabinet of Vienna, from Mr. G. N. Lawrence, of New York, and from Mr. Moore, Curator of the Derby Museum, Liverpool.

Before commencing our synopsis of the species of *Cracidæ* we will say a little concerning the labours of former workers on this group, from the days of Linnæus.

Sect. II. Brief Chronological Account of the Writings of the Principal Authorities on the Cracidæ.

(1766.) Linnæus, in the twelfth edition of the 'Systema Naturæ,' establishes the genus Crax with five species. Of these, C. rubra is the female of C. globicera, leaving four valid Linnæan species of this genus. The only Penelopine bird recognized is placed in the genus Phasianus. It is P. motmot, Linn. (= Ortalida motmot). (1780, about.) In the 'Planches Enluminées,' published about

(1780, about.) In the 'Planches Enluminées,' published about this date, four species of *Cracidæ* are figured, viz. :---

Pl.	86.	Le Hocco : faisan de la Guianne	(=)	Crax daubentoni).
				C. alobicera \mathcal{Q}).

78	Faisan	le Pierre de	Canonno	(- Paus	ni naloata)

75. Faisan, le Fierre de Cayenne (= Fauxi galeata).
338. Faisan verdâtre de Cayenne (= Penelope marail).

(1783.) Boddaert, in his 'Table des Planches Enluminées,' gives the name *Phasianus katraka* to Pl. Enl. 146 (which is *Ortalida motmot*).

(1784.) Jacquin, in his 'Beyträge zur Geschichte der Vögel,' figures two species of *Penelope*, *Crax cumanensis* (t. 19) and *C. pipile* (t. 11). These are both probably referable to the same species, viz. *Pipile cumanensis*.

(1786.) Merrem, in his 'Avium Icones et Descriptiones' (fasciculus secundus, p. 40), establishes three divisions of Craces :—(1) Crax, Linnæus; (2) Penelope (type P. jacupema); (3) Ortalida (type Phasianus motmot, Linnæus). He figures his P. jacupema, which is probably = P. marail, and his P. leucolophos, which is certainly = Pipile cumanensis.

(1788.) Gmelin, in his 'Systema Naturæ,' makes no alteration in Crax, but adopts Merrem's genus Penelope with six species. Three of these are good, viz. (1) P. cristata, (2) P. cumanensis = Pipile cumanensis, and (3) P. marail. Gmelin's P. satyra is a Ceriornis, and his P. vociferans is perhaps one of the Mexican Ortalidæ. Phasianus motmot and P. parraka of the same author are both equal to O. motmot.

(1790.) Latham, in his 'Index Ornithologicus,' very little advances our knowledge. His $Crax \ galeata = Crax \ pauxi$, Linneæus; but Linnæus's specific name having been made generic by Temminck, the name galeata must be adopted.

(1802.) Azara, in his 'Apuntamientos para la historia natural de los pajaros del Paraguay,' gives recognizable descriptions of four species of this group :---(1) el Yacúhú, upon which P. obscura of

505

506 MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ. [June 9,

Temminck is founded; (2) el Yacu-caraguata = Ortalida canicollis of Wagler; (3) el Yacu-apati = P. jacutinga of Spix; and (4) el Mitu, a good species, united by subsequent authors with Crax alector, till Mr. Gray named it Crax sclateri.

(1811.) Humboldt, in his 'Recueil d'Observations de Zoologie' (vol. i. p. 4), describes a new Ortalida from the River Magdalena, and calls it *Phasianus garrulus* (= Ortalida garrula).

(1815.) Temminck, in the second volume of his 'Histoire Naturelle des Pigeons et des Gallinacés,' gives an excellent account of what was then known of the *Cracidæ*, referring them to three genera of his "Aves gallinæ," namely Pauxi, Crax, and Penelope. The genus Pauxi is here first established for P. galeata and P. mitu. In *Crax* Temminck places C. globicera (= C. daubentoni), C. rubra (= C. globicera \mathfrak{Q}), C. alector, and C. carunculata, the last species being now described for the first time. Of Penelope he gives seven species, two of which are now first established, viz. P. obscura upon Azara's "Yacúhú," and P. superciliaris. These both stand good. Temminck unites Ortalida with Penelope. He also gives good anatomical descriptions and figures of the larynges and tongues of several of the species of Cracidæ.

(1823.) In the 'General History of Birds' (vol. viii.), Latham arranges the *Cracidæ* known to him in two genera of his Gallinaceous order, "*Guan*" and "*Curassow*." To the former he assigns eleven species, to the latter eight species. Little original matter is given.

(1823.) In the twenty-sixth livraison of the 'Planches Coloriées' Temminck publishes an article on the genus Ourax (= Pauxi), and gives a good figure of Ourax mitu (= Mitua tuberosa).

(1825.) Spix, in the second volume of his 'Aves Brasilienses,' describes and figures seven species of *Crax* and seven of *Penelope*, viz.:--

	Or this synopsis.
(1) Crax fasicolata	= C. pinima'(?).
(2) C. urumutum	= Nothocrax urumutum
(3) C. tomentosa	= Mitua tomentosa.
(4) C. blumenbachii	= C. globicera \mathcal{Q} (?).
(5) C. globulosa	= C. globulosa.
(6) C. rubrirostris	= C. carunculata.
(7) C. tuberosa	= Mitua tuberosa.
(1) Penelope jacuacu	= P. boliviana (?).
 (1) Penelope jacuacu (2) P. jacucaca 	
(2) P. jacucaca	= P. jacucaca.
 (2) P. jacucaca (3) P. jacutinga (4) P. jacupeba 	= P. jacucaca. = P. jacutinga.
(2) P. jacucaca(3) P. jacutinga	= P. jacucaca. = P. jacutinga. = P. jacupeba.
 (2) P. jacucaca (3) P. jacutinga (4) P. jacupeba (5) P. jacupemba 	 = P. jacucaca. = P. jacutinga. = P. jacupeba. = P. superciliaris.

As is well known, neither Spix's figures nor his descriptions are very accurate; and until the original type specimens have been examined, some of these determinations must remain doubtful. But Spix has certainly added greatly to our knowledge of the group. Not less than three species of *Cracinæ* (viz. *Nothocrax urumutum*, *Mitua*)

1870.] MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ.

tomentosa, and Crax globulosa) and five species of Penelopinæ (viz. P. jacucaca, P. jacupeba, Pipile jacutinga, Ortalida guttata and O. araucuan) are due to the researches of his expedition.

(1828.) Lesson, in the second volume of his 'Manuel d'Ornithologie,' describes two new species of Guans discovered by Goudot, one of the travelling naturalists of the Jardin des Plantes, in the interior of New Granada. These are *Penelope aburri* (= Aburria carunculata) and Ortolida goudoti (= Chamæpetes goudoti). Lesson likewise establishes Crax albini, which probably = C. globicera \mathcal{Q} .

(1830.) Wagler publishes a concise but very important paper in the 'Isis,' his "Revisio generis *Penelope*," and describes eighteen species, dividing them into three sections, A, B, & C, corresponding exactly to the genera *Pipile*, *Penelope*, and *Ortalida*. His excellent diagnoses materially assist us in identifying Spix's species. Wagler describes six species as new from the specimens in the Berlin and Munich museums, upon which he founded his observations. These new species are *P. pileata*, *P. purpurascens*, *P. albiventris*, *P. ruficeps*, *P. vetula*, and *P. poliocephala*. The last four belong to the genus *Ortalida*. He also founds his *P. canicollis* upon the "*Yacu-caraguata*" of Azara, of which, however, he had not seen specimens. The whole of these seven Waglerian species are valid; and this paper may be regarded as the earliest scientific article (in a modern sense) upon this subject.

(1831.) Yarrell, at a meeting of this Society, describes the trachea of Crax yarrelli (i.e. Crax carunculata).

(1832.) Wagler, in an article on new genera and species of Mammals and Birds, published in the 'Isis,' institutes two new genera of *Cracidæ*, viz. *Salpiza* and *Chamæpetes*. As regards *Salpiza*, it seems that the group thus designated ought to be retained as typical *Penelope*, because Merrem's *Penelope jacupema* certainly belongs to it; so that Wagler's *Penelope* corresponds to what we call (following Reichenbach) *Pipile*, and Wagler's *Salpiza* to our *Penelope*.

(1833.) Prince Max of Neuwied, in his well-known 'Beiträge zur Naturgeschichte von Brasilien,' describes the four species of *Cracidæ* that he met with in the wood-region of South-eastern Brazil, in his usual full and accurate manner. These were (1) *Crax rubrirostris* (= C. carunculata), (2) Penelope superciliaris, (3) Penelope leucoptera (= Pipile jacutinga), (4) Penelope araucuan (= Ortalida albiventris).

(1835.) Bennett, in the second volume of the 'Gardens and Menagerie of the Zoological Society,' gives articles with woodcut illustrations on the following species of this group :---

Page		fr. Bennett's names. Crested Curassow	_	(Of this Synopsis.) Crax alector.
8-		Galeated Curassow		Pauxi galeata.
	129.	Razor-billed Curassow		Mitua tuberosa.
	131.	Guan	=	Penelope cristata.
	325.	Red Curassow		Crax globicera \mathfrak{Q} .
	227.	Red-knobbed Curassow		

507

δ.

508 MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ. [June 9,

The last of these species is here first described as new under the name *Crax yarrelli*; but the name had been previously mentioned, P. Z. S. 1830-31, p. 33.

(1836.) Johann Müller, in his article upon the different forms of the penis in the class of birds (Abh. Ak. Berlin, 1836, p. 137), shows that *Crax* and *Penelope* agree with *Tinamus* in possessing a small rudimentary penis, which is never found in the ordinary *Gallinaceæ*.

(1837.) Swainson, in his 'Classification of Birds,' arranges Crax (ranking Penelope and the other genera as its subgenera) as a genus of his subfamily Megapodinæ, and family Columbidæ.

(1844.) Mr. G. R. Gray, in Gray and Mitchell's 'Genera of Birds,' vol. iii., arranges the *Cracidæ* as the first family of his order GALLINÆ, and divides them into two subfamilies, *Penelopinæ* and *Cracinæ*. The *Penelopinæ* contain three genera :—*Ortalida*, with a nominal list of fourteen species; *Penelope*, with ten species; and *Oreophasis*, with one, viz. O. *derbyanus*, which remarkable bird is now introduced into science, and very beautifully figured. Mr. Gray's second subfamily (*Cracinæ*) is divided into two genera, *Crax* and *Pauxi*. An excellent figure is given of the female of *Pauxi galeata*. Six species are referred to *Crax* and three to *Pauxi*. Altogether Mr. Gray enumerates thirty-four species of *Cracidæ* as now known to science; but it must be born in mind that several of the names given are merely synonyms. Three subsequently described species are added to the list in the appendix to this work.

(1844-46.) Tschudi, in his 'Fauna Peruana,' gives four species of Cracinæ and six species of Penelopinæ as met with in the woodregion of Eastern Peru. His identifications of these birds must be received with caution, being in some cases apparently only founded on recollection. Crax temminckii, which he describes as new, is certainly the Central-American C. globicera. Penelope aspersa, described as new = Ortalida guttata; P. rufiventris = Chamæpetes goudoti. Tschudi, however, gives several interesting anatomical details, in particular concerning the penis of Penelope, in confirmation of Johann Müller's discoveries on this subject.

(1846.) The second volume of the 'Knowsley Menagerie' contains four large figures, by Lear, of species of *Penelope*, viz. :--

	Kno	wsley Menagerie.	(Of	this Synopsis.)
Pl.	8.	P. superciliaris	=	P. jacucaca.
	9.	P. pileata		P. pileata.
	10.	P. pipile	=	Pipile cumanensis.
	11.	P. purpurascens	=	P. marail.

(1847.) Sir William Jardine, in one of his articles on the birds of Tobago in the 'Annals of Nat. History,' describes Ortalida ruficauda as a new species from that island, and the following year ('Contributions to Ornithology, 1848) figures and describes its trachea.

(1848.) Cabanis, in the 'Fauna of British Guiana,' contained in the third volume of 'Schomburgk's Travels,' enumerates five species of *Penelopinæ* and four of *Cracinæ* as obtained by Schomburgk in that country. These are all probably rightly determined, except

1870.] MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ.

perhaps P. jacucaca, concerning the identification of which we entertain some doubts.

(1849.) Penelope pileata is figured by Des Murs in the 'Iconographie Ornithologique' from a specimen in the Paris Museum.

(1850.) Fraser, in the 'Proceedings' of this Society, describes two new *Cracidæ* from specimens living in the Knowsley collection, viz. *Crax alberti* and *Penelope nigra*, the latter being our *Penelopina nigra*. But note that the bird figured as the female of *C. alberti*, *l. c.* t. xxvii. is the female of *C. globicera*.

(1852.) Reichenbach, in his 'Avium Systema Naturæ,' which forms a kind of preface to his 'Handbuch der speciellen Ornithologie,' gives a list of genera of this family, mainly in explanation of the previously published lithographic plates of structural parts. He establishes two new genera—*Penelops* for *Penelope albiventris* of Lesson (= Ortalida lencogastra), and Aburria for Penelope aburri of Lesson. The former species is a typical Ortalida; the latter genus we adopt.

(1856.) Prince Charles Bonaparte publishes his 'Tableaux Paralléliques de l'Ordre des Gallinacés' in the 'Comptes Rendus' of the Academy of Sciences of Paris. After characterizing two new species of the group, viz. Pipile argyrotis (= Penelope argyrotis) and Ortalida montagnii (= Stegnolæma montagnii), but so shortly as to be unrecognizable without reference to the original specimens, in a table of the Craces, as he calls them, he divides these birds into two families, Cracidæ and Penelopidæ; of the former he enumerates ten species, of the latter twenty-nine. The synonymy and arraugement of the species are full of errors, and are barely worth criticism, showing the same marks of haste as most of his later writings. The genus Pipile, however, must take date from this paper.

(1856.) Burmeister gives an account of the Brazilian Cracidæ in the third volume of his 'Systematische Uebersicht der Thiere Brasiliens.' The general arrangement of the genera and higher groups is very good; but the species are not always correctly identified, and there are some errors in the localities : e.g. Crax blumenbachii, Spix, is united with Crax rubrirostris (i.e. C. carunculata) and C. fasciolata! The species met with by Burmeister himself in S.E. Brazil were only three, namely, Penelope superciliaris, P. araucuan (i.e. Ortalida albiventris), and Crax blumenbachii (i.e. C. carunculata). Burmeister arranges Opisthocomus as an intermediate form between Penelope and Crax; but those who do not go so far as to make this wonderful bird an order of itself (following Huxley) must, we think, at least give it the rank of a separate family.

(1858.) Von Pelzeln, in one of his articles on new birds in the Imperial Cabinet of Vienna, describes *Penelope cujubi* of Natterer's MS. and the two other species of the genus *Pipile*. He gives also Natterer's notes and remarks on these three birds.

(1860.) Baird, in his 'Birds of North America,' includes one member of this group as found on the Rio Grande, within the limits of the United States, and proposes to call it *O. m'calli*, the same bird having been previously referred to *O. vetula* by Lawrence, and

PROC. ZOOL. Soc.-1870, No. XXXIV.

509

510 MESSRS. SCLATER AND SALVIN ON THE CRACID.E. [June 9,

to O. poliocephala by Cassin. We have given our reasons below for considering Mr. Lawrence's determination as correct.

(1860.) Mr. G. R. Gray publishes a synopsis of the genus of *Penelope* in this Society's 'Proceedings,' giving short Latin characters of all the species known to him. Four species are described as new, viz.:— (Of this Synopsia)

G. R. Gray.	(Of this Synopsis.)
P. nigricapilla	= P. obscura.
P. bridgesi	= P. obscura.
P. sclateri	= P. sclateri.
P. lichtensteini	= P. argyrotis.

(1860.) Salvin, in the second volume of 'The Ibis' (p. 248), gives full details of the history of the *Oreophasis derbyanus*, which was previously entirely unknown except from Mr. Gray's figure.

(186-?.) Prof. Reichenbach publishes his "Vollständigste Naturgeschichte der Tauben und Taubenartigen Vögel," forming part of his 'Handbuch der speciellen Ornithologie.' We cannot find any date attached to any part of this work, and therefore cannot give the exact date of issue. Reichenbach divides the natural family Cracidæ into two groups-Cracinæ and Penelopinæ, and, in order to fill up the voids in the number of his ridiculous quaternary system, associates with them the Didina and Microdactylina (i.e. the Cariamas), and constitutes out of this heterogeneous mass his family " Alectorinæ," the fourth division of his " Columbariæ." Reichenbach's account of the genera and species of Cracidæ is, as regards merit, about on a par with the above-mentioned arrangement of the higher divisions of the group. It is evidently a wretched compilation, written mainly without reference to original specimens. No less than four new species of Crax and one of Penelope are sought to be established solely upon figures of the older authors; and Crax itself is subdivided into four subgenera (Crax, Mituporanga, Crossolaryngus, and Sphærolaryngus), the very distinct Crax urumutum being left among the typical Craces! Ortalida leucogastra and O. albiventris are referred to the genus Chamæpetes! Penelopsis (established in the 'Av. Syst. Nat.' as Penelops) is here transferred, to become the type of a genus uniting P. rufiventris of Tschudi and P. adspersa of the same author !

(1866.) Mr. G. R. Gray describes, in this Society's 'Proceedings,' a new species of *Penelope*, *P. greeyi*, from a specimen living in the Society's gardens.

(1867.) Mr. G. R. Gray publishes his 'List of specimens of Birds of the Order Gallinæ in the British Museum.' In this important work the *Cracidæ* are arranged as the second family of the order, the first being the *Pteroclidæ*, and the third the *Megapodidæ*. This is no doubt very nearly its natural position, as the *Pteroclidæ* are still more nearly allied to the *Columbæ* than the Peristeropodous *Gallinæ*. As in his 'Genera of Birds,' Mr. Gray divides the *Cracidæ* into two subfamilies, *Penelopinæ* and *Cracinæ*. To the former subfamily are referred three genera (*Penelope*, *Ortalida*, and *Oreophasis*), containing altogether thirty-five species represented in the national collection. The names of ten other species are referred to as perhaps valid. Six species of this subfamily are here described as new, viz. :

G. R. Gray.	(Of this Synopsis.)
Penelope jacquini	= Pipile cumanensis.
Ortalida superciliaris	= 0. superciliaris.
O. bronzina	= 0. ruficauda.
O. plumbeiceps	= 0. vetula.
O. wagleri	= 0. wagleri.
O. cinereiceps	= 0. cinereiceps.

Mr. Gray's second subfamily, *Cracinæ*, is divided into two genera, *Crax* and *Pauxi*, the former containing seven, the latter three species. Three species of *Crax* are likewise mentioned, of which no specimens are in the national collection. Two species of *Crax* are described as new, viz. *C. sclateri* and *C. daubentoni*. We mainly agree with, and have very nearly followed, Mr. Gray's discrimination of the species of this difficult genus, the principal difference being that we have restored to the species which he calls *C. blumenbachii* what we have endeavoured to show is its older name, *C. globicera*.

(1867.) Salvin, in his article on the birds of Veragua, published in the 'Proceedings' of this Society, describes a second species of the genus *Chamæpetes*, *C. unicolor*.

(1868.) Prof. Huxley, in his article "On the Classification and Distribution of the Alectoromorpha and Heteromorpha," published in this Society's "Proceedings," defines the Alectoromorpha, or typical Gallinaceous birds, and shows that they are divisible into two primary groups—the *Peristeropodes* and *Alectoropodes*, of which the former embraces two families, the *Cracidæ* and *Megapodidæ*. The exact position of the *Cracidæ* in the Systema is thus first accurately determined.

(1869.) Dr. Cabanis, in one of his articles upon the birds of Costa Rica, describes as new Ortalida frantzii, which, however, = 0. cinereiceps, G. R. Gray (1867).

(1870.) The third portion of Von Pelzeln's 'Ornithologie Brasiliens' contains a most important addition to our knowledge of the CRACIDÆ in the account of the species of this group collected by Natterer, altogether 22 in number. Two of these are described as new; and a third (*Crax mikani*) is characterized from specimens in the Imperial Cabinet derived from another source. Descriptions are likewise given of other, imperfectly known species; and many important notes are added, taken either from Natterer's MS. or from v. Pelzeln's own observation. The subjoined list will show the alterations we have ventured to propose in v. Pelzeln's nomenelature :—

	ras. v. Pelzeli		
P. 28	30. Penelope cri	stata = Penelope greey	?
- 28	31. P. nigricapil		
	3. P. nattereri	= Pipile cumanen	sis.
- 28	34. P. grayi	= P. cumanensis.	
		perciliaris= Ortalida arauc	uan.

C

511

Orn. Bras.	V. Pelzeln.	(Of this Synopsis.)
P. 285.	O. araucuan	= 0. albiventris.
286.	O. albiventris	= 0. guttata.
343.	Crax mikani 3	= Crax daubentoni.
.,	C. mikani 🎗	= C. alberti.

Sect. III. Synopsis of the Species of Cracidæ.

The 51 species of Cracidæ known to us seem to be naturally separable into three subfamilies. The external differences between the first two of these groups, although very appreciable to the eye, are not easily expressed in strict definition. There can, however, be no doubt that the Curassows and Guans belong to naturally distinct forms; and Prof. Huxley (P. Z. S. 1868, p. 297) has pointed out a trenchant difference in the proportions of their pelvis, which renders their skeletons easily recognizable. In the *Penelopinæ* the "moiety of the dorsal aspect of the pelvis, which is bounded in front by a line drawn through the acetabula," or "postacetabular area" (as Prof. Huxley proposes to call it), is comparatively broad; in the *Cracinæ* it is narrow. Combining this osteological character with a marked divergence in the form of the rostrum of the two sections, we may divide the subfamilies as follows :—

α.	area postacetabulari angusta: rostro superiore altiore	-	~
	quam latum; culmine compresso	1.	CRACINÆ.
Ь.	area postacetabulari lata: rostro superiore latiore quam		
	altum : culmine depresso.		
	a'. vertex plumis obtectus: mesorhinium nudum:		
	nares patulæ	II.	PENELOPINÆ.
	b'. vertex tuberculo osseo munitus : mesorhinium		
	dense plumosum : nares absconditæ	III.	OREOPHASINÆ.

Taking these three subfamilies in order, we propose to arrange them as follows :---

Subfam. I. CRACINÆ.

 a. rostri cera mollis, plus minusve tumida: nares patulæ in media maxilla positæ b. rostrum usque ad basin corneum, cera nulla: nares ad basin 	1.	Crax.
maxillæ positæ. a'. lora nuda, nares patulæ	2.	Nothocrax.
 b'. lora dense plumosa, nares plumis absconditæ. a''. sexus dissimiles: tuberculum frontale maximum, oviforme b''. sexus similes: culmen valde elevatum sed vix tuberculatum 	3.	Pauxi.

Genus 1. CRAX.

Type.

Crax, Linn. S. N. i. p. 269 (1766) C. alector. Mituporanga, Reichenb. Tauben, p. 136 (186 ?).... C. globicera. Crossolaryngus, Reichenb. Tauben, p. 136 (186 ?)... C. globulosa. Sphærolaryngus, Reichenb. Tauben, p. 136 (186 ?)... C. alberti.

Clavis specierum.

a. pectore immaculate nigro.		
a. pectore immaculate nigro. a'. mandibularum caruncula nulla.		
a". loris plumosis	1.	globicera.
b". loris nudis.		J
a'''. cauda tota nigra	3.	alector.
b'''. cauda albo terminata	3.	sclateri.
b'. mandibula carunculata.		
c''. cera flava.		
(cauda tota nigra	4.	alobulosa.
{ cauda tota nigra cauda albo terminata	5.	daubentoni.
d". cera rubra	6.	carunculata.
e''. cera cærulea	7.	alberti
b. pectore nigro albo transfasciolato		

1. CRAX GLOBICERA.

Crax globicera, Linn. S. N. i. p. 270 (partim); Taylor, Ibis, 1860, p. 311; Salvin, Ibis, 1861, p. 143; Sclater, P. Z. S. 1860, p. 253; Lawr. Ann. Lyc. N. Y. viii. p. 12, ix. p. 139; Frantz. J. f. O. 1869, p. 373. Crax temminckii, Tsch. F. P. Aves, p. 287. Crax alberti, Q, Fraser, P. Z. S. 1850, p. 250, tab. xxviii. (Q.) Crax blumenbachii, G. R. Gray, List of Gall. p. 15. Crax alector, Scl. & Salv. Ibis, 1859, p. 223; Moore, P. Z. S. 1859, p. 61. Crax rubra, Linn. S. N. i. p. 270 (2); Temm. Pig. et Gall. iii. p. 21 et p. 687 (2); Lawr. Ann. L .N. Y. vii. p. 301 (2); Bennett, Gard. & Men. Z. S. ii. p. 225 (♀). Curasso bird, Edwards's Gleanings, pl. 295; unde Crax edwardsi, Reich. Tauben, p. 134. Crax albini, Lesson, Trait. d'Orn. p. 484 (\mathcal{Q}). Nitenti-nigra : ventre imo crissoque albis : cristæ elongatæ plumis nigris, apicem versus recurvis : loris plumulosis : cera tuberculata et rostro ad basin luteis, rostri apice cærulescente : pedibus cærulescenti-corneis: long. tota 34 poll. Angl., alæ 18.5, caudæ 15.5, tarsi 4.7. Fem. Castanea, ventre imo cinnamomeo : dorso superiore plus minusve nigro induto : capite cristato et cervice undique nigris,

minusve nigro induto : capite cristato et cervice undique nigris, albo maculatis : alis extus caudaque nigro et ochraceo plus minusve variegatis et transfasciatis : rostro nigricante, apice pallide cærulescente : pedibus corneis.

Hab. Western Mexico (*Deppe*); Tehuantepec (Sumichrast in Mus. Smithson.); prov. Vera Cruz (Sallé); Guatemala, Vera Paz and Pacific coast (Salvin); Belize (Leyland); Honduras (Taylor); Costa Rica (v. Frantz.); Panama (M'Cleannan).

Mus. Brit., Smithson., S.-G.

Linnœus's Crax globicera is founded mainly upon the Crax curassous of Brisson (Orn. i. p. 300), which is more likely to be intended for this species than for any other. Brisson mentions the *tubercula* ad basin rostri, rotunda, lutea—which excludes every thing except the present bird and C. daubentoni. And as he says nothing whatever of the tail being tipped with white, the balance of evidence is in favour of the former hypothesis. Crax rubra of Linnæus, founded 514 MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ. [June 9,

upon Crax peruvianus of Brisson (l. c. p. 305), is, there can be little doubt, intended for the female of the present bird.

The first author who appears to have correctly identified these birds as male and female is Tschudi, who, in his 'Fauna Peruana,' accurately describes both sexes under the name *Crax temminckii*, from specimens obtained by Deppe in Western Mexico; but he is no doubt in error in supposing that this was the species that he himself saw in the wood-region of Eastern Peru.

In our first paper on the Ornithology of Guatemala we erroneously called this bird *Crax alector*. This mistake was subsequently rectified, and the Central-American bird was referred to *Crax globicera*, which name has generally been adopted by more recent writers for the Central-American bird.

In Mr. G. R. Gray's 'List of Gallinæ' this Curassow is called *Crax* blumenbachii, following Spix's figure (Av. Bras. ii. t. 64). It is possible Mr. Gray may be correct in this reference, as we have seen Central-American specimens nearly as dark as represented in Spix's figure; but if this be so, it can hardly be true, as Spix states, that his specimen was obtained from Rio.

This Curassow is the only species of the genus and subfamily met with in America, north of Panama. We have examined a large number of specimens from different localities between the isthmus and Sonthern Mexico. The male is quite constant in colour, except that in one Panama specimen the tail shows a very narrow margin of white. The female, on the contrary, is very variable, as we have already pointed out in our diagnosis. In some specimens the wings are wholly red, in others much banded with black and cinnamomeons; in some specimens also the tail-bands are very slight, and almost evanescent; in others they are broad and conspicuous. The upper portion of the back varies from black to chestnut.

2. CRAX ALECTOR.

Crax alector, Linn. S. N. i. p. 269; Tenım. Pig. et Gall. iii. p. 27 et p. 689; Vieill. Gall. Ois. ii. p. 6, t. 199; Cab. in. Schomb. Guian. iii. p. 746; Reichenb. Tauben, p. 130; Bennett, Gardens & Men. ii. p. 9; Pelzeln, Orn. Bras. p. 286.

Purpurascenti-nigra : ventre imo crissoque albis : cristæ brevis plumis nigris, versus apicem recurvis : loris nudis : cera et rostro ad basin flavis, hujus apice cærulescente : pedibus corneis : long. tota 35, alæ 14.5, caudæ 13.5, tarsi 4.5.

Fem. Mari similis, sed crista intus albo parce transfasciata.

Hab. British Guiana (Schomb.); Rio Negro, Rio Vaupé, and Rio Brancho (Natt.).

Mus. Brit., Vindob., S.-G.

The species most liable to be confounded with the present Curassow are *Crax globicera* and *Crax sclateri*. From both of these it is distinguishable by the purple tinge of its plumage, which is very noticeable in living specimens, but is also plainly shown in skins. From *C. globicera* it is likewise distinguishable by the naked lores and by the want of the protuberance on the cere; from *C. sclateri* by the absence of the white tips to the tail-feathers and the black thighs. It differs not only from these, but from almost all other members of the genus in the sexes being nearly alike.

The patria of *C. alector* is Guiana and the adjoining districts of Amazonia up to the Rio Negro. In Upper Amazonia it is replaced by *C. globulosa*.

3. CRAX SCLATERI.

Mitu, Azara, Apunt. iii. p. 83. no. 338.

Crax alector, Hartl. Ind. Az. p. 22.

Crax sclateri, Gray, List of Gall. p. 14; Pelzeln, Orn. Bras. p. 287. Crax circinatus, Licht. MS. in Mus. Berol. (teste Pelzelno).

Crax discors, Natt. MS. in Mus. Berol. (teste Pelzeluo).

Crax azaræ, Natt. MS. in Mus. Vindob. (teste Pelzelno).

- Nitenti-nigra : ventre imo, crisso et caudæ apice albis : cristæ mediocris plumis nigris versus apicem recurvis : loris nudis, cera et rostro ud basin flavis : pedibus corneis : long. tota 32, alæ 14, caudæ 14, tarsi 4.
- Fem. Supra nigra, ochracescenti-albo, nisi in cervice, transfasciata: crista alba, basi et apice nigris: subtus gula et cervice nigris: abdomine cinnamomeo, pectore nigro transfasciato: rostri basi obscura, apice cum pedibus flavicantibus.

Hab. Paraguay (Azara et Page); Mato Grosso (Natterer).

Mus. Brit., Vindob., Smithson., S.-G.

Azara clearly describes both sexes of this Curassow, which appears to be the sole representative of the group in Paraguay and the adjacent portion of the Brazilian province of Matto Grosso.

It was, however, confounded with other species, or provided only with MS. names, till Mr. Gray described it in his list of Gallinæ in 1867.

As already remarked, the male of this species closely resembles the corresponding sex of *C. alector*; it is singular, therefore, that the females of the two species should be so very different.

Our description of *Crax sclateri* is taken from Nattererian specimens in the collection of Salvin and Godman; but we have compared them with Smithsonian skins collected by Capt. Page in Paraguay, and find them agree in every respect.

4. CRAX GLOBULOSA,

Crux globulosa, Spix, Av. Bras. ii. p. 50, t. $65(\circ)$, $66(\circ)$; Reichenb. Taub. p. 135.

Crax globicera, Bates, Nat. on the Amazon, ii. p. 112.

Nitenti-nigra: ventre imo crissoque albis: crista nigra recurva: loris plumosis: cera tuberculata et mandibula utrinque ad basin carunculata flavis: rostri apice nigra: pedibus rubris: long. tota 36, alæ 16, caudæ 14.5, tarsi 4.4.

Fem. Mari similis, sed tuberculo et carunculis rostri nullis: ventre fulvo: pedibus rubescentibus.

Hab. Upper Amazon (Spix); Pebas (Castelnau et Deville); Rio Napo (Mus. G. N. L.)

Mus. Brit., Paris., ct G. N. Lawrence.

5]6 MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ. [June 9,

The well-developed yellow caruncles at the base of the mandible distinguish this species from all its allies except *C. daubentoni*, in which the tail is broadly tipped with white. We have only seen one female of this species—in Mr. Lawrence's collection. It agrees with Spix's figure and description. The variation of the sexes in this bird corresponds to that which obtains in *Crax carunculata*, which has likewise conspicuous caruncles on the base of the bill. It the latter case, however, the caruncles are red instead of yellow.

5. CRAX DAUBENTONI.

Hocco, Faisan de la Guiane, Buff. Pl. Enl. 86.

Crax aldrovandi, Reichenb. Columb. p. 134?

Crax daubentoni, G. R. Gray, List of Gall. p. 15.

Crax globicera, Temm. Nat. Hist. des Gall. iii. p. 12 et p. 686; Reichenb. Taub. p. 133.

Crux mikani \mathcal{J} , Pelzeln, Orn. Bras. p. 343 (\mathcal{Q})?

Nitenti-nigra : ventre imo et caudæ apice albis : cristæ elongatæ plumis nigris recurvis : laris plumosis : cera tuberculata et mandibula utrinque ad basin carunculata flavis : pedibus nigricantibus : long. tota 32, alæ 15.5, caudæ 14, tarsi 4.5.

Fem. Mari similis, sed crista ad basin albo obsolete fasciata : ventre et tibiis albo transfasciolatis : cera et rostro nigris.

Hab. Venezuela, near Caraccas (Levraud).

Mus. Brit., Paris.

This Curassow was confounded by the older authors with C. globicera; and it must always, perhaps, remain somewhat of an open question to which bird that name is more properly to be applied. Mr. Gray first recognized the existence of the two species, and in his 'List of Gallinæ' gave the name *daubentoni* to the present bird, considering it to be that represented by Buffon and Daubenton as the *Hocco*, *Faisan de la Guiane* in the 'Planches Enluminées.' The two species are certainly close allies, the differences between them consisting in the present bird having caruncles at the base of the mandible, and white tips to the rectrices. The former character, however, is not very conspicuous, nor are these caruncles represented in the above-mentioned plate.

We were for some time in doubt respecting the correct habitat of this species; but during a recent examination of the examples of this group in the Paris Museum, Sclater found a specimen of it which had been transmitted from the vicinity of Caraccas by M. Levraud. This has indicated, what we before suspected, that the true *patria* of *Crax daubentoni* is the littoral of Venezuela and the northern portions of New Granada, where it takes the place of *C. globiceru* on the north and *C. alector* on the south*.

^{*} Since this paper was written, the locality of this species has been further confirmed by the receipt by this Society of a living pair of this *Crax* from Tucacas, in Northern Venezuela (presented by James Wright, Esq., Sept. 29th).

The bird described by Herr v. Pelzeln as the male of his Crax mikani seems to agree tolcrably well with the female of this species.

6. CRAX CARUNCULATA.

Crax carunculata, Temm. Pig. et Gall. iii. pp. 44, 690 (1815); Sw. An. in Men. p. 183.

Crax rubrirostris, Spix, Av. Bras. ii. p. 51, t. 67; Max. Beitr. iv. p. 528.

Crax blumenbachii, Burm. Syst. Ueb. iii. p. 345.

Crax yarrellii, Bennett, Gard. and Men. ii. p. 227; Yarrell, P. Z. S. 1830-1, p. 33; Sw. An. in Men. p. 188; Jard. et Selby, Ill. Orn. iv. pl. vi.

- Nitenti-nigra : ventre imo crissoque albis : crista nigra, versus apicem recurva: loris nudis: ceræ tuberculo parvo et caruncula utringue ad basin mandibulæ rubris : pedibus carneis : long. tota 34, alæ, 15.5, caudæ 13.5, tarsi 4.
- Fem. Mari similis, sed crista albo fasciolata et ventre imo crissoque rufis.

Hab. Wood-region of S.E. Brazil from Rio to Bahia (Max. et Burm.).

Mus. Brit.

This Curassow is easily distinguishable by its red bill, and has therefore been less often confounded with other species than most of its congeners. Burmeister, however, has united it to Crax blumenbachii of Spix, supposing that Spix's figure (Av. Bras. ii. t. 64) may represent the female of the present bird. This we cannot agree to. Spix's plate obviously represents the female of C. globicera, or of some allied species of which we do not yet know the male. If his locality (Rio) be correct, the latter is probably the case.

7. CRAX ALBERTI.

Crax alberti, Fraser, P. Z. S. 1850, p. 246, t. 27; Gray, List of Gallinæ, p. 15; Reichenb. Tauben, p. 136.

Crax mikani 9, Pelzeln, Orn. Bras. p. 343 (?).

- Nitenti-nigra : ventre imo, crisso et caudæ apice albis : crista brevi, recurva, nigra: loris dense plumosis: ceræ tuberculo et mandibulæ carunculis cæruleis : rostri apice corneo : pedibus plumbeis.
- Fem. Nigra: crista albo fasciolata: dorso, alis extus et cauda albo anguste transfasciatis : remigibus externis et abdomine toto castaneis : ventre medio crissoque pallidioribus : pedibus pallide carneis.

Hab. New Granada.

Mus. Brit., Paris., S.-G.

Mr. Fraser first described this Curassow, which may be readily known by its densely feathered lores and blue wattles, from a specimen living in the aviaries at Knowsley in 1850. It is, however, obvious that the bird described by him as the female of C. alberti is not the true female of this species, but that of Crax globicera.

Crax alberti is now not unfrequently brought alive to this country. There have been of late years several males in the Society's Gardens; and at the present time there is one female. Its correct habitat has

never yet been given; but we have recently obtained abundant evidence that it inhabits New Granada. A female in the collection of Salvin and Godman was transmitted direct from Bogotá by Mr. G. Crowther. There is a male in the Paris Museum, sent from the same locality by Dr. Lindig, and a female from Sta. Martha by M. Bonnecourt.

The bird described by Herr v. Pelzeln as the female of his Crax mikani seems to be the female of this species.

8. CRAX PINIMA.

Crax pinima, Pelzeln, Orn. Bras. p. 287 et p. 341. Crax fasciolata, Spix, Av. Bras. ii. p. 48, t. 62, a (?).

Nigra: cristæ plumis recurvis, albis, ad basin et ad apicem nigris: dorso toto, alis extus et cauda albo transfasciolatis: abdomine cervino, pectore et lateribus nigro transfasciatis: loris nudis, aut plumulis paucis obsitis: rostro nigro, ad basin flavo notato: pedibus rubris: long. tota 29, alæ 13.5, cauda 11.5, tarsi 3.7. Hab. Vicinity of Pará (Natt.).

Mus. Vindob.

Natterer obtained a single specimen of the bird described by Pelzeln as Crax pinima in the neighbourhood of Pará, and, as stated by v. Pelzeln, had at first doubts as to its being a valid species. He remarks in his MS. that the Mutum pinima, as it is called there, does not differ from the Curassow of Cujabá and Paraguay (i.e. C. sclateri). Afterwards he appears to have changed his opinion, and to have designated the present species C. pinima. Natterer did not determine the sex of his single specimen ; and it is therefore possible that it may have been a female. The specimen we have described is undoubtedly of that sex, as it was formerly living in the Society's collection, and was determined by Mr. Bartlett. Comparing it with two undoubted females of C. sclateri, we find it differs principally in the narrowness of the transverse bars above, in the sides of the belly being transversely barred with black, and the broad white tips to the tail-feathers. Pelzeln describes C. pinima as smaller than C. sclateri; but our specimen is of about the same dimensions. Nor in the bird we describe is it correct to say "Plumæ cristæ nigræ, fasciis solum duabus albis ornatæ," as the crest is white, with the bases and tips of the feathers black.

These differences, however, are of no very great importance; and, on the whole, we are of opinion that the *Mutum pinima* of Pará will be found to constitute a different species from *Crax sclateri*. Whether, however, the male will be found to resemble the female, or the corresponding sex of *C. sclateri*, remains to be proved. Vou Pelzeln describes what he considers may possibly be the male of this species, from a specimen formerly living in the Imperial Menagerie at Schönbrunn, but does not point out how it is to be distinguished from *C. sclateri*.

There are two birds now living in the Society's Gardens which are probably referable to this species. One of them was acquired, some years ago, along with the bird from which we have taken our characters, and is identical with it in plumage; the other, which has been recently purchased from the Jardin d'Acclimatation, is apparently darker, and has the white bands on the upper surface extremely narrow.

Genus 2. NOTHOCRAX.

Nothocrax, Burm. Syst. Ueb. iii. p. 347 N. urumutum.

NOTHOCRAX URUMUTUM.

Crax urumutum, Spix, Av. Bras. ii. p. 49, t. 62; Cab. in Schomb. Guian. iii. p. 746; Reichenb. Tauben, p. 132; Pelzeln, Orn. Bras. p. 288.

Urax urumutum, Burm. Syst. Ueb. iii. p. 347.

Rufescens, nigro vermiculata; pilei cristati plumis elongatis pendentibus nigris: cervice undique et corpore subtus castaneis, ventre imo in cinnamomeum trahente: cauda nigricante, rectricum pogoniis externis rufescentibus nigro vermiculatis: spatio oculari late nudo, in ave viva cærvlescenti-flavo: rostro rubro: pedibus corylinis: long. tota 24, alæ 12, caudæ 10, tarsi 2.6.

Hab. British Guiana (Schomb.); Rio Negro (Spix et Natt.); Rio Pastaza, Upper Amazons (E. Bartlett).

Mus. Brit., Vindob., Derb.

Genus 3. PAUXI.

Pauxi, Temm. Pig. et Gall. iii. p. 683 (1815)	P. galeata.
Ourax, Cuv. Règn. An. i. p. 440 (1817)	P. galeata.
Lophocerus, Swains. Class. of B. ii. p. 353 (1837)	
Urax, Reichenb. Av. Syst. Nat. p. xxvi (1842)	P. galeata.

PAUXI GALEATA.

Crax pauxi, Linn. S. N. i. p. 270.

Pierre de Cayenne, Buff. Pl. Enl. 78.

Crax galeata, Lath. Ind. Orn. ii. p. 624.

Pauxi galeata, Temm. Pig. et Gall. iii. p. 1 et p. 683; Reichenb. Tauben, p. 137.

Ourax pauxi, Cuv. Règn. Anim. 1817, i. p. 441; Bennett, Gard. & Men. ii. p. 65.

Lophocerus galeatus, Swains. Classif. of B. ii. p. 353 et An. in Men. p. 184.

Ourax galeata, Tsch. F. P. p. 289.

Nigra æneo nitens: ventre imo et caudæ apice albis: pilei plumis brevibus, erectis: tuberculo frontali maximo, oviformi, cæruleo: rostro rubro: pedibus carneis: loris dense plumosis: long. tota 34, alæ 16, caudæ, 13, tarsi 4.

Fem. Rufescens, nigro undulata et vermiculata, capite undique nigro : tectricum alarium et secundariorum marginibus et caudæ apice albicantibus.

Hab. Cayenne (Buffon); Rio Cassiquiari and Orinoco (Natt.); Venezuela, near Caraccas (Levraud in Mus. Paris).

Mus. Brit., Paris.

519

Type.

Type

520 MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ. [June 9,

Buffon assigns Cayenne as the habitat of this Curassow; but Schomburgk does not mention it as found in British Guiana. A more certain locality is the Rio Cassiquiari and Upper Orinoco, where Natterer, although he did not collect specimens, obtained certain evidence of its existence (*Cf.* Von Pelzeln, Orn. Bras. p. 289). Specimens of this bird in the Paris Museum were transmitted from Caraccas by M. Levraud. Tschudi states that it occurs in Eastern Peru. This is possible, but we have never seen it in collections from the Upper Amazon*.

Genus 4. MITUA.

Mitu, Less. Trait. d'Orn. ii. p. 485 (1831) M. tuberosa. Mitua, Strickl. Ann. Nat. Hist. vii. p. 36 (1841) M. tuberosa.

Type.

Clavis specierum.

a. rostri culmine cultrato: candæ apice albo..... 1. M. tuberosa. b. rostri culmine rotundato: candæ apice rufo 2. M. tomentosa.

1. MITUA TUBEROSA.

Crax mitu, Linn. S. N. i. p. 270.

Pauxi mitu, Temm. Pig. et Gall. iii. pp. 8, 685.

Mitu brasiliensis, Reichenb. Columb. p. 137.

Ourax mitu, Cuv. Règ. An. 1817, i. p. 441; Temm. Pl. Col. 153; Bennett, Gard. and Men. ii. p. 129.

Urax mitu, Burm. Syst. Ueb. iii. p. 349.

Crax tuberosa, Spix, Av. Bras. ii. p. 51, t. 67 a.

Mitua tuberosa, Bates, Nat. on the Amazon, ii. p. 112.

Urax tuberosa, Burm. Syst. Ueb. iii. p. 348.

Ourax erythrorhynchus, Swains. Classif. of B. ii. p. 352, et An. in Men. p. 187.

Urax eythrorhynchus, Cab. in Schomb. Guian. iii. p. 747.

Nigra, purpurascente perfusa: ventre imo castaneo: caudæ apice albo: loris dense plumosis: pilei plumis elongatis, retroductis: culmine valde elevato, antice cultrato, postice et supra nares incrassato, rubro: pedibus rubris: long. tota 33, alæ 14, caudæ 12, tarsi 4.

Fem. Mari similis.

Hab. British Guiana (Schomb.); Pará, Rio Madeira, Mato Grosso (Natterer); Rio Tapajos (Bates); Eastern Peru, Chamicurros (E. Bartlett).

Mus. Brit., Vindob., S.-G.

2. MITUA TOMENTOSA.

Crax tomentosa, Spix, Av. Bras. ii. p. 49, t. 63. Pauxi tomentosa, G. R. Gray, Gen. of B. iii. p. 487.

* Since this paper was written, the Society have received two living males of this species direct from Santa Martha along with a female of *Crax alberti*. It is probable, therefore, that *Pauxi galeata* is likewise found in the valley of the Magdalena.

1870.] MESSRS. SCLATER AND SALVIN ON THE CRACID.E. 521

Urax tomentosa, Cab. in Schomb. Guian. iii. p. 746; Burm. Syst. Ueb. iii. p. 349.

Nigra, purpureo nitens : ventre imo castaneo : caudæ apice rufo : pilei plumis subelongatis, paulum exstantibus : loris dense plumosis : rostri culmine elevato, subcompresso, rotundato, rubro, apice flavicante : pedibus rubris : long. tota 33, alæ 15, caudæ 13.5, tarsi 4.5.

Fem. Mari similis.

Hab. British Guiana (Schomb.); Rio Negro (Spix et Natt.); Rio Brancho (Natt.)

Mus. Brit., Vindob., S.-G.

Subfam. II. PENELOPINÆ.

Conspectus generum Penelopinorum.

a. gulæ palear medium.		
a'. remiges externi angustati sed integri.		
a". gula plumosa	1.	Stegnolæma.
b". gula nuda.		U C
a'''. sexus similes	2.	Penelope.
b'''. sexus dissimiles	3.	Penelopina.
b'. remiges externi excisi.		1
a ^{'''} . palear breve	4.	Pipile.
b''. palear elongatum, lineare	5.	Aburria.
b. gulæ palear nullum.		
a'. gula plumosa : remiges externi excisi	6.	Chamæpetes.
b'. gula nuda, linea media setosa : remiges externi integri.		

Genus 1. STEGNOLÆMA*, gen. nov.

Characteres Penelopes, sed gula summa omnino plumosa, spatio solum in gula inferiore denudato diversa.

STEGNOLÆMA MONTAGNII.

Ortalida montagnii, Bp. C. R. xlii. p. 875 (1856); Reich. Taub. p. 147; Scl. P. Z. S. 1857, p. 19; 1858, pp. 76, 556; 1860, pp. 63, 72.

Supra olivaceo-brunnea, purpureo subinduta, pileo obscuriore, capitis plumis albo anguste marginatis: dorso inferiore ferrugineo: subtus olivacea, plumis albo marginatis, lateribus et ventre imo ferrugineo perfusis: rostro obscure aurantiaco, pedibus corylinis: long. tota 20, alæ 10.2, caudæ 9.5, tarsi 2.5.

Hab. Int. New Granada; Ecuador, Rio Napo (Verreaux); Matos, Chillanes, Nanegal et Puellaro (Fraser).

Mus. Brit., S.-G.

Genus 2. PENELOPE.

Penelope, Merrem, Av. Ic. et Descr. ii. p. 40 (1786) . . P. cristata.

Salpiza, Wagler, Isis, p. 1226 (1832) P. pileata.

* στεγνόν, tegmen, et λαιμός, gula.

Clavis specierum.

a, cauda fascia terminali nulla.	
a'. secundariis unicoloribus, immarginatis.	
a'', abdomine æneo-viridi.	
a'''. pileo immaculato, unicolori.	
maxima 1. purpurascens.	
{ media	
maxima 1. purpurascens. media 2. marail. minor 3. greeyi.	
b'''. pileo albo variegato.	
a"", superciliis albis, infra nigro mar-	
rinatis	
ginatis	
f major magis viridescens 5. jacupeba.	
f major, magis viridescens 5. jacupeba. minor et obscurior 6. obscura.	
b", abdomine summo æneo, imo rufo.	
$\alpha^{\prime\prime\prime}$. genis unicoloribus immarginatis	
∫ major : uropygio ferrugineo 7. cristata.	
{major: uropygio ferrugineo	
b'''. genis argenteo marginatis	
c''. abdomine toto castaneo	
f pileo albo 10. pileata.	
) pille information 11 palmagastra	
pileo rufescente 11. ochrogastra.	
b'. secundariis extus rufo marginatis 12. superciliaris.	
b. cauda fascia terminali cinnamomea 13. argyrotis.	

1. PENELOPE PURPURASCENS.

Penelope purpurascens, Wagl. Isis, 1830, p. 1110; Moore,
P. Z. S. 1859, p. 61; Sclater, P. Z. S. 1859, pp. 369, 391; Sclat.
et Salv. Ibis, 1859, p. 223; G. R. Gray, List of Gallinæ, p. 6. Salpiza purpurascens, Wagl. Isis, 1832, p. 1226.

Æneo-olivacea : dorsi superioris, alarum tectricum et corporis subtus ad medium ventrem plumis albo marginatis : long. tota 35, alæ 15.5, caudæ 15.5, tarsi 4.

Hab. Mexico, Mazatlan (Bischoff in Mus. Smiths.); Tonila (Xantus); Oaxaca (Boucard); Jalapa (De Oca); Guatemala, Vera Paz, and Pacific Slope (Salvin); Honduras (Dyson).

Mus. Brit., Smithson., S.-G.

This is the only species of *Penelope* we have seen from any part of America north of Nicaragua. In Costa Rica and Panama it is replaced by *P. cristata*, which is easily distinguished by its deep rufous uropygium and lower belly.

2. PENELOPE MARAIL.

Faisan verdatre de Cayenne, Buff. Pl. Enl. 338.

Penelope jacupema, Merrem, Av. Ic. et Descr. ii. p. 41, tab. xi. (?)
Penelope marail, Gnuel. S. N. i. 734; Wagler, Isis, 1830, p. 1110;
Temm. Pig. et Gall. iii. p. 56 et p. 692; G. R. Gray, List of Gall.
p. 6.

Salpiza marail, Wagl. Isis, 1832, p. 1226; Cab. in Schomb. Guian. iii. p. 745.

Penelope purpurascens, J. E. Gray, Knowsl. Menag. t. 11.

Obscure viridescenti-ænea : cervicis supremæ et corporis subtus

ad medium pectus plumis albo marginatis: ventre imo paulum fuscescentiore: long.tota 30, alæ 12.5, caudæ 14, tarsi 3.2. Hab. British Guiana.

Mus. Brit.

P. marail, though resembling the previous species, is readily distinguishable by its smaller size and darker colour, and by the absence of white markings on the upper portion of the back. Its range seems strictly confined to the Guianas.

It must always remain doubtful what species Merrem's Penelope jacupema was intended for; but his description seems more applicable to the present bird than to P. cristata, to which it is sometimes referred.

3. PENELOPE GREEYI.

Penelope greeyi, G. R. Gray, P. Z. S. 1866, p. 266, t. xxii. Penelope cristata, Pelzeln, Orn. Bras. p. 280 (?).

Similis præcedenti, sed crassitie minore, et colore supra viridi magis purpurascente, forsan diversa: long. tota 24, alæ 11, caudæ 10.5, tarsi 2.4.

Hab. Santa Martha, New Granada.

Mus. Brit.

This seems to be a small form of the preceding species. Besides the type specimen described by Mr. Gray, we have only seen two other examples, which are now living in the Society's Gardens.

If Herr v. Pelzeln's *P. cristata* be not referable to the present species it must belong to one which we have not yet come across.

4. PENELOPE JACUCACA.

Penelope jacucaca, Spix, Av. Bras. ii. t. 69, p. 53; Wagler, Isis, 1830, p. 1110.

Salpiza jacucaca, Wagl. Isis, 1832, p. 1226; Cab. in Schomb. Guian. iii. p. 745.

Penelope superciliaris, J. E. Gray, Knowsl. Menag. ii. pl. 8.

Fuliginoso-nigricans, æneo nitens : tectricibus, plumis sincipitis, juguli, pectoris et epigastrii albo marginatis ; vitta superciliari nivea, inferius atro marginata : aurium plumis nigris albo variolosis : long. tota 30, alæ 13. (Wagler.)

Hab. Brazil, prov. Bahia (Spix); British Guiana (Schomb.). Mus. Derb.

Of this Guan we have only yet met with three specimens, now living in the Society's Gardens. They were purchased of a dealer in Liverpool on the 9th of February last, and were in very bad plumage when received, though now gradually recovering. We have little hesitation in referring them to Spix's species, when explained by Wagler's diagnosis, which we have adopted in the absence of specimens for complete examination.

The "Eyebrowed Guan" of the Knowsley Menagerie is referable to this species, though coloured too rufescent in tint. We have examined the typical specimen now in the Derby Museum at Liverpool.

This species is included by Schomburgk in his 'Fauna of British Guiana;' but it is doubtful whether it really occurs so far north.

5. PENELOPE JACUPEBA.

Penelope jacupeba, Spix, Av. Bras. n. p. 54, t. 71.

Penelope nigricapilla, Pelzeln, Orn. Bras. pp. 281, 341 (nec G. R. Gray).

Penelope jacucaca, Gray, List of Gall. p. 8 (nec Spix).

Eneo-viridis: dorso inferiore et abdomine toto cupreo perfuso: dorsi superioris, alarum tectricum et corporis subtus ad imum pectus plumis albo utrinque marginatis: frontis et superciliorum plumis argenteo marginatis: long. tota 30, alæ 13.5, caudæ 12.5, tarsi 3.3.

Hab. Brazil, prov. San Paulo (Natt.); Rio (Mus. S.-G.); Pará (Spix).

Mus. Brit., Vindob., S.-G.

Our characters of this species are from one of the specimens obtained by Natterer at Ytararé, and named by Herr v. Pelzeln P. nigricapilla. It is not, however, Mr. Gray's P. nigricapilla, but agrees perfectly with the specimen in the British Museum referred to P. jacucaca of Spix. At first we were inclined to accede to the latter determination, but have recently convinced ourselves that Spix's figure and description of *P. jacucaca* are more satisfactorily applicable to another bird, of which we have given an account above, and which is distinguishable from the present species by its smaller size and by the well-defined white superciliary band, bordered (as Wagler expressly states) by black below. On the other hand, Spix's figure and description of P. jacupcba are fairly applicable to the present bird, except as regards its larger size. But a second skin of an immature example in the collection of Salvin and Godman is considerably smaller than the Nattererian specimen above described, and seems to answer to Spix's bird in every respect; so that if we assume that Spix's type was also not adult (which his figure would seem to indicate), we have a name provided for this species.

We may remark that Mr. G. R. Gray agrees with us in referring Spix's *P. jacupeba* to the present species, though in our opinion he has wrongly associated it with *P. jacucaca* of the same author.

Penelope jacupeba, as thus identified, is a fine large species of a general bronzy-green colour, which is somewhat tinged with rufescent on the rump and tail-coverts and still more so on the belly. The feathers of the whole top of the head are more or less edged with silvery grey, particularly on the front and over the eyes, but not so as to constitute a well-defined superciliary stripe; the ear-coverts are black. The characteristic white edgings which are found in all the group are well-defined in this species on the upper back, wing-coverts, neck, and breast. The outer primaries are attenuated as in other species of this genus; the fifth, sixth, and seventh are about equal and longest. The nearest ally of *P. jacupeba* is *P. obscura*,

from which it is mainly distinguishable by its larger size and generally greener and lighter colour.

6. PENELOPE OBSCURA.

El Yacúhú, Azara, Apunt. iii. p. 72. no. 335.

Penelope obscura, Temminck, Pig. et Gall. iii. p. 68, et p. 693; Vieill. Nouv. Dict. xxxvi. p. 343, et Enc. Méth. 361; Wagler, Isis, 1830, p. 1111.

Penelope nigricapilla, G. R. Gray, P. Z. S. 1860, p. 269; List of Gall. p. 7; Reichenb. Tauben, p. 152.

Penelope bridgesi, G. R. Gray, P. Z. S. 1860, p. 270; List of Gall. p. 7; Reichenb. Handb. Tauben, p. 151.

Obscure æneo-viridis: dorso inferiore et abdomine toto chocolatino-brunneis: dorsi superioris, tectricum alarium et corporis subtus ad medium ventrem plumis albo marginatis: pilei antici plumis argenteo anguste marginatis: long. tota 25, alæ 11.5, caudæ 12, tarsi 3.

Hab. Paraguay (Azara); Rio Vermejo et Rio Paraguay (Page); Bolivia (Bridges).

Mus. Brit., Smiths. et S.-G.

The examination of four skins of this Guan obtained by Capt. T. J. Page during his expeditions up the Parana and its confluents in the United-States steamer 'Waterwitch,' and now in the Smithsonian Collection, have enabled us to identify it with Azara's Yacuhu, which has hitherto remained unrecognized. Not only does the bird agree sufficiently well with Azara's description, but one of Capt. Page's specimens bears a label with "Pavo del Monte" written on it, the provincial name, according to Azara, of his Yacuhu. It follows, therefore, that we must use for this bird the name obscura, founded by Temminck upon Azara's description.

Upon comparing the above-mentioned birds with the types of *Penelope bridgesi* and *P. nigricapilla* in the British Museum we have no doubt of their identity. The latter has but faint traces of white markings on the head; but two of Capt. Page's specimens, which we consider not quite mature, have likewise but very slight indications of this feature. Having thus had the advantage of examining six specimens of this Guan at one time, we see that considerable variation is shown in the extent of the white markings on the feathers of the head, a character upon the constancy of which Mr. Gray seems to have depended too much when differentiating his *P. nigricapilla* and *P. bridgesi*.

7. PENELOPE CRISTATA.

Meleagris cristata, Linn. S. N. i. p. 269 (?).

Penelope cristata, Lath. Ind. Oru. ii. p. 619; Temm. Pig. et Gall. iii. p. 46 et p. 691; Wagler, Isis, 1830, p. 1110; Burm. Syst. Ueb. iii. p. 339.

Salpiza cristata, Wagl. Isis, 1832, p. 1226; Cab. in Schomb. Guian. iii. p. 745.

PROC. ZOOL. SOC.—1870, No. XXXV.

Penelope purpurascens, Lawr. Ann. Lyc. N. Y. viii. p. 12. Penelope brasiliensis, Bp. C. R. xlii. p. 877. Penelope jacuaca, Salvin, Ibis, 1869, p. 317.

The Guan, Bennett, Gardens & Men. Z. S. ii. p. 131.

Æneo-viridis, pileo obscuriore : dorso imo et ventre toto cum crisso castaneis : corporis subtus plumis albo marginatis : long. tota 35, alæ 14.5, caudæ 15, tarsi 3.5.

Hab. Costa Rica (Carmiol); Panama (M'Cleannan); New Granada (Mus. S.-G.); British Guiana (Schomb.).

Mus. Brit., S.-G.

Whatever the *Meleagris cristata* of Linnæus may have been intended for, there seems to be little donbt that the *Penelope cristata* of Latham, Temminck, and Wagler refers to this species, which is readily known by its large size (almost equal to that of *P. purpurascens*) and the deep chestnut of the lower back and belly.

Mr. Gray considers *P. jacuacu* of Spix referable to the present species; but it seems to us that it is much more reasonable to refer Spix's figure and description to the next, similar but smaller species, which is from the very country where Spix discovered it.

We have examined specimens of this bird from Costa Rica, Panama, and New Granada; we have not yet met with Guianan examples, and it is possible that they may belong to the next species.

8. PENELOPE BOLIVIANA.

Penelope jacuacu, Spix, Av. Bras. ii. p. 52, t. 68 (?).

Penelope boliviana, Reich. Taub. p. 151; Bp. C. R. xlii. p. 877; G. R. Gray, List of Gall. p. 7 (1867); Pelz. Orn. Bras. pp. 282, 339.

Penelope rufescens, Natt. MS.

Supra æneo-viridis: dorsi superioris et tectricum alarum plumis albo marginatis, dorso inferiore fuscescente: subtus, præcipue in ventre, rufescens; cervicis et pectoris plumis albo marginatis: long. tota 26, alæ 12·3, caudæ 13, tarsi 3·4.

Hab. Solimoens (Spix); Rio Madeira et Lake Manaqueri, Upper Amazon (Natterer); Yurimaguas (E. Bartlett); Rio Huallaga (Pöppig).

Mus. Brit., Vindob., S. & G.

This Guan most nearly resembles the large species we have called $P.\ cristata$, but is distinguishable by its smaller size, by the lower back being only slightly rufescent instead of deep chestnut, by the well-defined white edgings of the feathers of the upper back (which are almost, if not quite, absent in $P.\ cristata$), and by the rufescent colour below extending over the lower surface of the breast, though with a more subdued tint.

Our description is taken from one of Natterer's Amazonian specimens, which agrees with the bird called *P. boliviana* in the British Museum, and with Mr. Bartlett's skin from Yurimaguas.

There is a living example of this bird now in the Society's Gardens.

1870.] MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ.

9. PENELOPE SCLATERI.

Penelope sclateri, G. R. Gray, P. Z.S. 1860, p. 270; List of Gall. p. 7; Reichenb. Columb. p. 181.

Supra fuscescenti-ænea, dorso postico sordide rufescente: piler antici, superciliorum et genarum plumis argenteo limbatis: dorso superiore et alis extus albo parce flammulatis: subtus magis brunnescens, pectore albo flammulato: ventre toto crissoque saturate rufis: long. tota 22, alæ 10.2, caudæ 9.8, tarsi 2.35. Hab. Bolivia (Bridges).

Mus. Brit., Derb.

With this Guan we are only acquainted from inspection of the typical specimens in the National Collection. It seems to be a well-marked species, easily recognizable by the silvery white edgings of its superciliaries and cheeks. In other respects it is somewhat like *Stegnolæma montagnii*, but has the whole throat nude.

10. PENELOPE PILEATA.

Penelope pileata, Wagl. Isis, 1830, p. 1110; G. R. Gray, List of Gall. p. 7; Pelz. Orn. Bras. pp. 282, 340; Des Murs, Icon. Orn. t. 23.

Pipile pileata, Reichenb. Columb. p. 153.

Salpiza pileata, Wagl. Isis, 1832, p. 1226; J. E. Gray, Knowsl. Menag. t. 9.

Obscure æneo-viridis; pileo albo, postice rufescente; genis et linea superciliari nigris: interscapulii et tectricum alarium plumis albo marginatis: collo undique et corpore subtus castaneis: ventre albo flammulato: long.tota 29, alæ 12, caudæ 13, tarsi 3.2.

Hab. Amazonia: vic. of Pará (Wagler); Rio Madeira and Rio Vautá (Natterer).

Mus. Brit., Vindob., S. & G.

11. PENELOPE OCHROGASTER.

Penelope ochrogaster, Pelz. Orn. Bras. pp. 282, 337.

Supra obscure fusca, uropygium versus rufescens; dorsi superioris et tectricum alarum plumis albo marginatis: pileo rufescente, frontis et superciliorum plumis albo marginatis: linea superciliari et genis nigris: subtus castanea, usque ad medium ventrem albo flammulata: long. tota 29, alæ 13.5, caudæ 14.5, tarsi 3.5.

Hab. Brasil. int. near Cuyaba (Natt.).

Mus. Vindob., S. & G.

Obs. Species a præcedente simili pileo rufescente et cervice postice minime castanea distinguenda.

12. PENELOPE SUPERCILIARIS.

Penelope superciliaris, Temm. Pig. et Gall. iii. p. 72 et p. 693 (1815); Wagl. Isis, 1830, p. 1110; Max. Beitr. iv. p. 539; Burm. Syst. Ueb. iii. p. 337; Gray, List of Gall. p. 7; Pelz. Orn. Bras. p. 282.

Salpiza superciliaris, Wagl. Isis, 1832, p. 1226.

Penelope jacupemba, Spix, Av. Bras. ii. p. 55, t. 72.

Supra æneo-viridis, superciliis angustis albis : secundariorum uropygii et caudæ tectricum plumis rufo marginatis : subtus magis cinerea, plumis usque ad medium ventrem albo marginatis : ventre imo et crisso rufescentibus : long. tota 26, alæ 9.8, caudæ 10.8, tarsi 2.7.

Hab. Wood-region of S.E. Brazil (Max. et Burm.); vic. of Bahia (Wucherer); provinces of Rio and San Paulo (Natt.).

Mus. Brit., Vindob., Smithson., S. & G.

The rufous edgings to the secondary wing-feathers render this Guan readily recognizable. The superciliary stripe, although distinct, is not so broad as in *P. jacucaca*, nor does it extend across the fore-head as in the latter species.

There are several examples of this bird now living in the Society's Gardens.

13. PENELOPE ARGYROTIS.

Pipile argyrotis, Bp. C. R. xlii. p. 875 (1856).

Penelope montana, Licht. in Mus. Berol. (Nomencl. p. 86); Bp. C. R. xhii. p. 877 (descr. nulla); Reichenb. Tauben, p. 151.

Penelope lichtensteinii, G. R. Gray, P. Z. S. 1860, p. 269; et List Gall. p. 7 (1867).

Fuscescenti-æneo-viridis : dorsi superioris, alarum tectricum et corporis subtus plumis albo marginatis : uropygio et ventre imo cum lateribus rufescentibus : pileo cuprescenti-æneo, frontis, superciliarum et genarum plumis albo marginatis : caudæ rectricibus lateralibus æneo-nigris, fascia apicali pollicari cinnamomea terminatis, mediis rufescentibus apicem versus cinnamomeis : long. tota 25, alæ 11, caudæ 11, tarsi 2·3.

Hab. Venezuela, S. Martha (Verreaux); Caraccas (Mus. Paris.); Int. of New Granada, Bogotá (Mus. S.-G.).

Mus. Brit., Paris., S. & G.

Sclater has examined two skins of this Guan in the Paris Museum, which are marked *Pipile argyrotis* in Bonaparte's own handwriting, and has thus determined the species to which the term is referable. This could hardly have been even guessed at from the fragment of description attached to the name in the 'Comptes Rendus.'

The distinct and peculiar terminal tail-band at once distinguishes this *Penelope* from all its congeners.

Genus 3. PENELOPINA.

Type.

Penelopina, Reichenb. Columb. p. 152 P. nigra.

PENELOPINA NIGRA.

Penelope nigra, Fraser, P. Z. S. 1850, p. 246, pl. 29; Sclat. et Salv. Ibis, 1859, p. 224; Salv. P. Z. S. 1867, p. 160.

Penelopina nigra, Reichenb. Tauben, p. 152.

1870.] MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ.

Purpurascenti-nigra unicolor, subtus in ventre magis obscura: rostro et cum pedibus gula nuda rubris: long. tota 24, alæ 9.5, caudæ 10.5, tarsi 2.8.

Fem. nigra, rufo frequentissime vermiculata : pectore fere immaculato.

Hab. Guatemala, Vera Paz, and Volcanoes of Agua and Fuego (Salvin).

Mus. Brit., S.-G.

Genus 4. PIPILE.

Genus 4. PIPILE.	Type.
Penelope, Wagler, Isis, p. 1226 (1832)	
Pipile, Bp. C. R. xlii. p. 877 (1856)	

Clavis specierum.

a. Caruncula gulari cærulea		1. P. cumanensis.
b. Caruncula gulari rubra		
f plaga alari alba	,	2. P. jacutinga.
alis nigris, albo stri	atis	3. P. cujubi.

1. PIPILE CUMANENSIS.

Crax cumanensis, Jacquin, Beytr. t. 10, p. 25 (1784).

Crax pipile, Jacquin, ibid. t. 11, p. 26.

Penelope cumanensis, Gm. S. N. i. p. 734; Wagl. Isis, 1830, p. 1109; Léotaud, Ois. de Trin. p. 383; Pelzeln, Sitz. Ak. Wien, xxxi. p. 330.

Penelope pipile, Temm. Pig. et Gall. iii. p. 76 et p. 694; Cab. in Schomb. Guian. iii. p. 745; Gray, Knowsley Menag. ii. t. 10; Sclater, P. Z. S. 1855, p. 163, 1858, p. 76.

Pipile cumanensis, Bp. C. R. xlii. p. 877; Reichenb. Tauben, p. 154; Sclat. et Salv. P. Z. S. 1859, p. 598.

Pipile nattereri, Reichenb. Tauben, p. 154. Penelope nattereri, Pelzeln, Oru. Bras. p. 283. Penelope jacquinii, G. R. Gray, List of Gallinæ, p. 8. Penelope grayi, Pelzeln, Orn. Bras. p. 284.

Nigra, æneo-nitens : pileo toto cum fronte albis, scapis plumarum angustissime nigris: tectricum alarium et pectoris plumarum marginibus cum plaga magna alari albis : genis omnino nudis et cum caruncula gulari cæruleis : long. tota 27, alæ 13, caudæ 11, tarsi 2.5.

Hab. British Guiana (Schomb.); Venezuela (Beauperthuy in Mus. Par.); Trinidad (Léotaud); Bogotá (Mus. S.-G.); Mato-Grosso, Upper Amazon, and Rio Negro (Natt.); Eastern Peru, Cosnipata valley (Whitely); Bolivia (D'Orb. in Mus. Par.); Rio Napo (Verreaux).

Mus. Brit., Paris., Vindob., S.-G.

The specimen in the British Museum distinguished by Mr. Gray as P. jacquinii (said to be from Peru) seems to us to be hardly separable from the present species. The shafts of the head-feathers are dark, and more distinctly marked ; the white of the head extends rather further down the neck, and there is rather more white on the larger wing-coverts, than in the specimens assigned in the British

530 MESSRS. SCLATER AND SALVIN ON THE CRACIDÆ. June 9,

Museum to P. cumanensis; but in other respects the examples of the two supposed species agree.

Von Pelzeln has named two Nattererian specimens of Pipile from Mato Grosso (Orn. Bras. p. 284) Penelope grayi, supposing them to be the P. jacquinii of Gray (nec Reichenbach), but does not explain how they differ from his P. nattereri, i. e. P. cumanensis.

2. PIPILE JACUTINGA.

Penelope pipile, var. a, Temm. Pig. et Gall. iii. p. 76, et p. 69. Penelope jacutinga, Spix, Av. Bras. ii. p. 53, t. 70 (1825); Gray, List of Gallinæ, p. 8; Pelzeln, Orn. Bras. p. 283.

Penelope leucoptera, Max. Reise, i. p. 139, ii. p. 110; Beitr. iv. p. 544. Penelope pipile, Wagl. Isis, 1830, p. 1109; Burm. Syst. Ueb. iii. p. 336 ; Pelzeln, Sitzungsb. Ak. Wien, xxxi. p. 329.

Penelope nigrifrons, Less. Tr. d'Orn. p. 482.

Pipile leucolophos, Bp. Compt. Rend. xlii. p. 877; Reichenb. Tauben, p. 152.

Pipile nigrifrons, Bp. C. R. xlii. p. 877.

Yacu-apeti, Azara, Apunt. iii. p. 80.

Nigra purpureo-nitens : fronte nigra : pileo cum nucha albo, scapis plumarum anguste nigris : plaga alari maxima et cervicis subtus pectorisque plumarum marginibus albis: genis partim plumosis cæruleis : caruncula gulari rubra : long. tota 28, alæ 14, caudæ 12, tarsi 2.6.

Hab. Wood-region of S.E. Brazil (Max. et Burm.); San Paulo (Natt.); Paraguay (Azara).

Mus. Brit., Vindob., S.-G.

3. PIPILE CUJUBI.

Penelope cujubi, Pelzeln, Sitzungsb. Ak. Wien, xxxi. p. 329 (1858); Orn. Bras. p. 284.

Pipile cujubi, Reichenb. Tauben, p. 153.

Brunneo-nigra, nitore violaceo: pileo nigro, plumis albo marginatis; fronte alba, scapis plumarum nigris: tectricibus alarum albo striatis: caruncula gulari rubra: long. tota 26, alæ 12.5, caudæ 11, tarsi 2.3.

Hab. Pará (Natt.).

Mus. Brit., Vindob., Paris.

There is one specimen of this rare Guan in the British Museum and one in the Paris collection, both originally from birds living in captivity. The species may be immediately distinguished by the want of the conspicuous white wing-patch, which is replaced by narrow edgings to some of the wing-coverts.

Genus 5. Aburria.

Type. Aburria, Reichenb. Av. S. N. p. xxvi (1859) .. A. carunculata.

ABURRIA CARUNCULATA.

Penelope aburri, Lesson, Dict. des Sci. Nat. lix. p. 191; Man. d'Orn. p. 482; ej. Compl. p. 426; Gray, List of Gall. p. 9.

Penelope carunculata, Temm. MS.

Aburria carunculata, Reichenb. Syst. Av. p. xxvi; Tauben, p. 141; Bp. C. R. xlii. p. 877; Sclater, P. Z. S. 1857, p. 19, et 1858, p. 76.

Nigra unicolor, ænco-viridescente induta: gula parce plumosa, caruncula longa vermiformi ornata: long. tota 29, alæ 13.5, caudæ 11.5, tarsi 2.8.

Fem. Mari similis.

Hab. Interior of New Granada; Valley of Cauca, and Mountains of Quindiu (Goudot); Rio Napo (Verr.).

Mus. Brit., S.-G.

Genus 6. CHAMÆPETES.

Chamæpetes, Wagler, Isis, 1832, p. 1227 C. goudoti.

Clavis specierum.

a. Fuscescenti-olivacea, abdomine castaneo 1. C. goudoti. b. Viridescenti-nigra, unicolor..... 2. C. unicolor.

1. CHAMÆPETES GOUDOTI.

Ortalida goudotii, Lesson, Man. d'Orn. ii. p. 217; Dict. d. Sc. Nat. lix. p. 195; Trait. d'Orn. p. 481; Compl. p. 442; Gray, List of Gall. p. 13.

Chamæpetes goudoti, Wagl. Isis, 1832, p. 1227; Reichenb. Tanben, p. 142.

Penelope rufiventris, Tsch. F. P. Aves, p. 291, t. xxxi.

Ortalida rufiventris, Sclater, P. Z. S. 1859, p. 147.

Fuscescenti-olivacea, æneo induta: subtus magis grisescens, abdomine toto castaneo: facic tota nuda, in ave viva cærulea: pedibus rubris: long. tota 19, alæ 9.5, caudæ 10, tarsi 2.5.

Hab. New Granada; Mountains of Quindiu (Goudot); Ecuador,
Pallatanga (Fraser); Andes of Peru, alt. 7200 ped. (Tschudi).
Mus. Brit., S.-G.

Sclater has examined the types of Tschudi's *Penelope rufiventris* in the Neuchatel collection, and is of opinion that, in spite of what Tschudi affirms, they are the same as *Ortalida goudoti*.

2. CHAMÆPETES UNICOLOR.

Chamæpetes unicolor, Salv. P. Z. S. 1867, p. 159; Lawr. Ann. N. Y. Lyc. ix. p. 139.

Nigra, viridescenti-nitens : abdomine paulo obscuriore : rostro nigro : pedibus rubris : long. tota 24, alæ 11, caudæ 11, tarsi 2.8.

Fem. Mari similis.

Hab. Veragua (Arcé); Costa Rica (Carmiol).

Mus. Brit., Smithson., S.-G.

Genus 7. ORTALIDA.

Type.

Type.

Ortalida, Merrem, Av. Ic. et Descr. ii. p. 40 (1786). O. motmot. Penelops, Reichenb. Syst. Av. p. xxvi (1853) O. albiventris.

Clavis specierum.		
a. remigibus externis fuscis aut æneo-fuscis. a'. rectricum externarum apicibus castaneis.		
a". pectore fere immaculato unicolori.		
a'''. rectr. ext. omnino castaneis	-	
∫ major, capite rufo	1.	motmot.
1 minor, capite fuscescente	2.	araucuan.
$b^{\prime\prime\prime}$. rectr. ext. castaneo terminatis.		c
<i>a''''</i> . capite rufo	З.	ruficeps.
$b^{\prime\prime\prime\prime}$. capite fusco.		
$a^{\prime\prime\prime\prime\prime}$. abdomine læte castaneo. $b^{\prime\prime\prime\prime\prime}$. abd. dilute rufescente		wagleri.
∫ pectore cervino	5.	ruficauda.
pectore cinereo	6.	canicollis.
b". pectore albo variegato.		
c'''. pileo rufescente		
∫ ventre albo	7.	albiventris.
ventre cinereo	8.	squamata.
$d^{\prime\prime\prime}$. pileo obscure cinereo.		
c'''. superciliis nullis		
major, pectoris plumis an-		
gust. marg minor, pectoris plumis latius	9.	caracco.
minor, pectoris plumis latius		
[marg	10.	guttata.
$a^{\prime\prime\prime\prime}$. superclins albis	11.	superciliaris.
b'. rectricum externarum apicibus albis aut cervinis.		
c". ventre cervino		
∫ major; cauda valde elongata	12.	poliocephala.
minor; cauda mediocri	13.	vctula.
$d^{\prime\prime}$. ventre albo	14.	leucogastra.
b. remigibus externis castaneis.		
c'. rectricum externarum apicibus albidis		
∫ capite rufescente	15.	garrula.
capite fuscescente	16.	cinereiceps.
d'. rectricum externarum apicibus castaneis	17.	crythroptera.

1. ORTALIDA MOTMOT.

Phasianus motmot, Linn. S. N. i. p. 271; Gm. S. N. i. p. 740. Faisan de la Guiane, Buff. Pl. Enl. 146. Phasianus katraca, Bodd.

Phasianus parraka, Gm. S. N. i. p. 740.

Penelope parrakoua, Temm. Pig. ct Gall. iii. p. 695; Burm. Syst. Ueb. iii. p. 341.

Phasianus parraqua, Lath. Ind. Orn. ii. p. 632.

Penelope motmot, Wagl. Isis, 1830, p. 1111.

Ortalida motmot, Wagl. Isis, 1832, p. 1227; Cab. in Schomb. Guian. iii. p. 744; Gray, List of Gallinæ, p. 10; Pelzeln, Orn. Bras. p. 285.

Supra æneo-fusca : alis extus caudæque rectricibus quatuor mediis magis æneis : capite toto rufo : subtus saturate grisea, ventre dilutiore : caudæ rectricibus externis castaneis : rostro plumbeo, apice flavicante : pedibus carneis : long. tota 23, alæ 8, caudæ 11, tarsi 2.8.

Hab. Cayenne (Buffon); Brit. Guiana (Schomb.); Rio Negro et Rio Brancho (Natt.).

Mus. Brit., Berol., Vindob., et S.-G.

In one of our skins of this species from the Rio Negro (*Natt.*), the three outer pairs of rectrices are wholly chestnut down to the base; in a second (from Demerara) there are traces of bronzy green at the base.

2. ORTALIDA ARAUCUAN.

Penelope aracuan, Spix, Av. Bras. ii. t. 74.

Penelope araucuan, Spix, Av. Bras. ii. p. 56; Wagl. Isis, 1830, p. 1112.

Ortalida araucuan, Wagl. Isis, 1832, p. 1227; G. R. Gray, List of Gall. p. 11.

Ortalida superciliaris, Pelzeln, Orn. Bras. p. 285.

Supra æneo-fusca unicolor, pileo parum obscuriore : subtus saturate grisea, ventro medio dilutiore : rectricibus quatuor mediis æneis, ceteris castaneis, ad basin æneis : rostro plumbeo, apice flavicante, pedibus plumbeis : long. tota 16.5, alæ 7, caudæ 8, tarsi 1.9.

Hab. Lower Amazonia, prov. Maranham (Spix); vicinity of Pará (Natterer).

Mus. Brit., Vindob., S.-G.

Obs. Similis præcedenti, sed crassitie minore et pileo obscuro nec rufo facile distinguenda.

This Ortalida must be carefully distinguished from O. albiventris of S.E. Brazil—a very different species, which has been called O. araucuan by Max. and Burmeister. O. albiventris is a larger bird, and has the head and uropygium bright rufous, and the belly white.

Natterer obtained examples of this bird at Pará, the Rio Muria, and Praia de Cajntaba. One of these is now in Salvin and Godman's collection. This species is probably the representative of *O. motmot* on the south bank of the Amazons.

3. ORTALIDA RUFICEPS.

Penelope ruficeps, Wagl. Isis, 1830, p. 111. Ortalida ruficeps, Wagl. Isis, 1832, p. 1227.

Pileo ac nucha rufis: notxo toto olivaceo-fusco: pectore griseoolivaceo: gastrxo griseo: cristo fuscescente: rectricibus duabus mediis aneo-fuscis, sequente concolori, apice rufescente: reliquis prima medietate et ultra aneo-fuscis: dein cinnamomeo-rufis.

Adult. long. tota 16.25, caudæ 7.8.

Hab. Brazil.

Mus. Berol.

Obs. Similis P. motmot et P. albiventris : a prima statura minore, caudæ pictura &c., ab altera uropygii, pectoris, caudæ colore, statura minore &c., satis distincta. (Wagler.)

We have no examples of this Ortalida; but Sclater has examined the type in the Berlin Museum, and believes it to be a good species. We have copied Wagler's description of it. It appears to be most like O. motmot, but is much smaller, and has the basal portion of the outer tail-feathers æneous.

4. ORTALIDA WAGLERI.

Ortalida wagleri, G. R. Gray, List of Gall. p. 11 (1867).

Supra olivacea, pileo nigricanti-plumbeo: subtus cinereo-olivacea, abdomine, hypochondriis, tibiis et crisso intense rufis: rectricibus quatuor utrinque externis rufo terminatis, reliquis æneo-viridescentibus: long. tota 26.5, alæ 10, caudæ 12, tarsi 3.

Hab. Western Mexico, near Mazatlan (Grayson).

Mus. Brit., Paris., Smithson.

The bright red belly renders this fine species almost unmistakable, its nearest ally being the following, in which the abdomen is only slightly rufescent.

The only exact locality we have met with for this species is Mazatlan, in the vicinity of which Col. Grayson obtained two skins, now in the Smithsonian collection. His notes state that the iris is dark brown, the feet grey, the bare space round the eye red and blue, and the bare sides of the throat red.

5. ORTALIDA RUFICAUDA.

Ortalida ruficauda, Jard. Ann. N. H. xx. p. 374 (1847); et Contr. Orn. 1848, p. 16, t. 4.

Ortalida bronzina, G. R. Gray, List of Gall. p. 11 (1867).

Supra æneo-fusca, pileo fuscescenti-plumbeo: subtus ochracea, gutture et pectore æneo perfusis: subalaribus, hypochondriis et crisso castaneis: cauda æneo-viridi, rectricibus quinque externis castaneo terminatis: rostro plumbeo, apice flavicante; pedibus obscure carneis: long. tota 19, alæ 7.8, caudæ 9, tarsi 2.2.

Hab. Tobago (Kirk); Venezuela (Mus. Berol. et Paris.).

Mus. Brit., Berol., Paris., S.-G.

Two examples of this species in the Berlin Museum from Venezuela were formerly confounded with *O. poliocephala*. We have taken our description from one of Kirk's original specimens, kindly presented to us by Sir William Jardine. We have compared this with *O. bronzina*, and find them identical.

This Ortalida probably also occurs in Trinidad, but is not mentioned by M. Léotaud. Specimens in the Paris Museum, transmitted by M. Beauperthuy, have been likewise erroneously named *polio*cephala.

6. ORTALIDA CANICOLLIS.

Jacú caraguata, Azara, Apunt. iii. p. 77 (no. 336).

Penelope canicollis, Wagl. Isis, 1830, p. 1112.

Ortalida canicollis, Wagl. Isis, 1832, p. 1227; Hartlaub, Ind. Az. p. 22; Pelzeln, Orn. Bras. p. 286.

Supra æneo-fusca, pileo cinereo : subtus magis ochracea, gutture et pectore æneo perfusis et hoc præcipue griseo subobsolete punctatis : subalaribus, hypochondriis et crisso castaneis : cauda æneo-viridi, rectricibus quinque externis castaneo late terminatis : rostro flavicante; pedibus pallide corylinis: long. tota 22, alæ 9.8, caudæ 10.3, tarsi 2.5.